

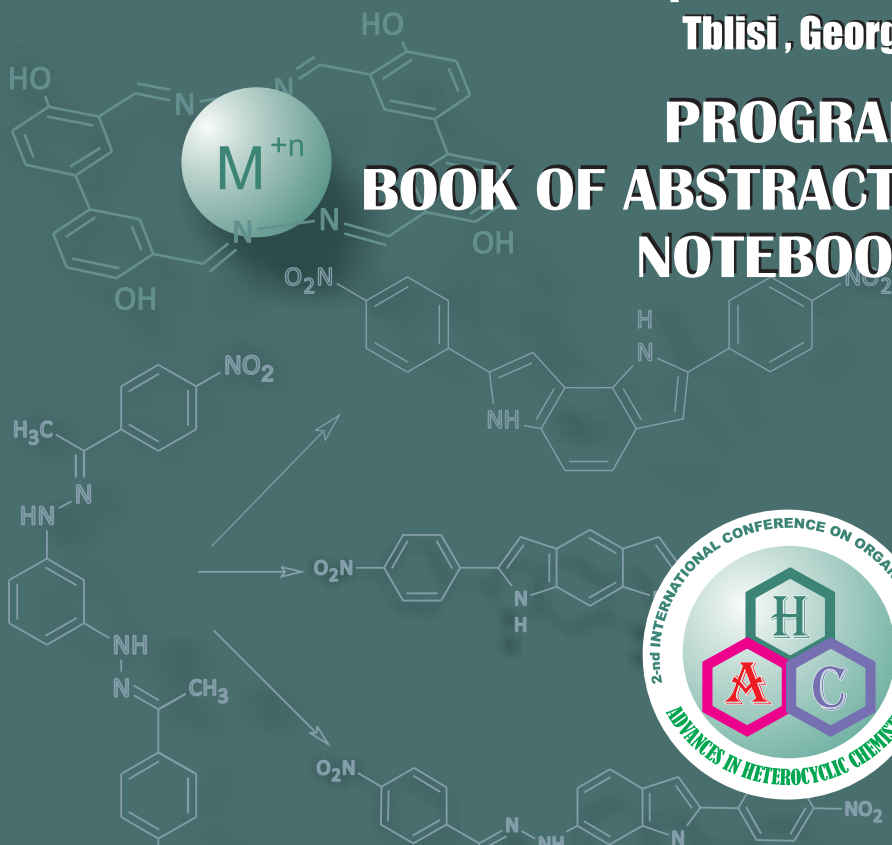
GeoHet-2011

2ND INTERNATIONAL CONFERENCE ON ORGANIC CHEMISTRY

Advances in Heterocyclic Chemistry

September 25-27,
Tbilisi, Georgia

PROGRAM BOOK OF ABSTRACTS NOTEBOOK



Wellcome!

The First Georgian Conference on organic chemistry was held two years ago in Signaghi – in one of the loveliest regions of Georgia – Kakheti (old Kiziki). In Signaghi the organizing committee took the decision to carry out the following conferences on organic chemistry with the different outlined topics in various cities of Georgia.

The second conference on organic chemistry “Advances in Heterocyclic Chemistry” - GeoHet-2011 will be held in the capital city of Georgia –Tbilisi on September 25-27, 2011. The Conference is sponsored by Rustaveli Science Foundation of Georgia (grant No. CF/21/6-420/11) and organized by Javakhishvili Tbilisi State University, Georgian Technical University and National Academy of Science of Georgia. The Conference partners are Association of Professional Chemists of Georgia, hotel “D-Plaza”, hotel “Prestige”, Media promotion is supported by World scientific publishing, Journal “Chemistry of Heterocyclic compounds”, ARKAT USA inc. “Arkivoc”, Digital Printing Center “ESPO”.

The organizing committee cordially hopes that with the assistance of scientists from around the world The Georgian International Conference on organic chemistry will become an interesting and attractive international conference on organic chemistry worldwide. For our 2-nd conference, we expect more than 150 attendees from 16 countries, including Armenia, Azerbaijan, Belarus, China, Georgia, Greece, India, Iran, Latvia, Pakistan, Russia, Switzerland, Turkey, Ukraine, USA and Uzbekistan.

We hope that the current conference will be a successful scientific meeting, summarizing the latest achievements of organic chemistry as well as chemistry of heterocyclic compounds.

Again, we thank all of you for attending this conference and wish you a pleasant, as well as memorable stay in Tbilisi.

Prof. Shota Samsoniya
Chairman of Conference

Acknowledgement: Financial support for this conference through the Shota Rustaveli National Science Foundation, under grant CF/21/6-420/11 is gratefully acknowledged.



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CONFERENCE SCHEDULER

SESSIONS OF THE CONFERENCE

SESSION A - SEPTEMBER 26, 2011

10.30-11.00

- IL 1. NOVEL HETEROCYCLIC SYSTEMS CONTAINING INDOLE FRAGMENTS.
SYNTHESIS, PROPERTIES, ANOMALOUS REACTIONS**
Sh. A. Samsoniya
Iv. Javakhishvili Tbilisi State University, Georgia

11.00-11.30

- IL 2. INTRODUCTION OF PHARMACOPHORE GROUPS VIA REARRANGEMENT OF
PYRIMIDINIUM SALTS**
G.G. Danagulyan
Russian-Armenian (Slavonic) State University, Armenia

11.30-11.45

- OP 1. MULTI-COMPONENT SYNTHESIS OF N-HETEROCYCLES IN DEEP EUTECTIC
SOLVENTS**
N. Azizi, M. Lashkaryzadeh
Chemistry and Chemical Engineering Research Center of Iran, Iran

11.45-12.00

- OP 2. STEREOCONTROLLED NON-BIOMIMETIC OXIDATIVE ADDITIONS UPON 1,4-
DIHYDROPYRIDINES: SYNTHESIS OF BICYCLIC HETEROCYCLIC COMPOUNDS
BY SEQUENTIAL ENAMINE REACTION AND FREE RADICAL CYCLISATION**
R. Kumar, D. Kumar and A. K. Prasad
University of Delhi, India

12.00-12.15

- OP 3. SYNTHESIS OF NEW HYDANTOINS AND THIOHYDANTOINS**
M. M. Ghanbari
Islamic Azad University, Iran

13.00-13.30

- IL 3. NOVEL BENZO[d]THIAZOLIMINO-5-ARYLIDEN-4- THIAZOLIDINONES AS CYCLOXYGENASE/LIPOXYGENASE AND MATRIX METALLOPROTEINASE INHIBITORS. ESTIMATION OF STRUCTURE-ACTIVITY RELATIONSHIP
Ph. Eleftheriou, A.Hazim, P.Vicini, A. Saxena, At.Geronikaki
Aristotle University, Greece.

13.30-13.45

- OP 4. SYNTHESIS OF HETEROCYCLES ON THE BASE OF ADDUCTS OF IODINEALKOXYLATION OF N-VINYL DERIVATIVES OF PYRROLIDONE AND PHTHALIMIDE
S.F.Garayev, G.M.Talibov
Azerbaijan State Oil Academy, Azerbaijan

13.45-14.00

- OP 5. ALKALOIDS- CONTAINING PLANT SPECIES OF GEORGIA FLORA AS SOURCES OF PHARMACOLOGICALLY ACTIVE ALKALOIDS
V.U. Vachnadze, L.G. Kintsurahvili, T.Sh.Suladze, N.S.Vachnadze, N. M. Gogitidze, I.S. Sikharulidze, A.Dz. Bakuridze
TSMU, I.Kutateladze Institute of Pharmacochimistry, Georgia

14.00-14.15

- OP 6. GREEN SYNTHESIS AND ANTI-TB ACTIVITY OF FLUORINATED PYRAZOLINE DERIVATIVES
Sh. N. Shelke, G. Mhaske
Department of Chemistry, S.S.G.M. College, Kopargaon, India

14.15-14.30

- OP 7. INFLUENCE OF THE NATURE OF SUBSTITUENT ON REACTIVITY OF 2,3-POLYMETHYLENE-3,4-DIHYDROQUINAZOLINE- AND -THIENO[2,3-D]-PYRIMIDINE-4-ONES IN REACTIONS WITH CARBONYL COMPOUNDS
Kh.M. Shakhidoyatov, B.Zh. Elmuradov, A.Sh. Abdurazakov, Kh.A. Bozorov
Institute of the Chemistry of Plant Substances, Republic of Uzbekistan

14.30-14.45

- OP 8. FLAVONOID GLYCOSIDES OF SOME PLANTS FROM GEORGIAN FLORA AND THEIR BIOLOGICAL ACTIVITY
N.Sh. Kavtaradze, K.G. Shalashvili
TSMU, Iovel Kutateladze Institute of Pharmacochimistry, Georgia

14.45-15.00

- OP 9. SYNTHESIS AND PESTICIDAL ACTIVITY OF 3-ALKYL-4-METHYL-5-(5-THIOXO-1,2-DIHYDRO-[1,2,4]TRIAZOL-3-YL)-3H-THIAZOLE-2-THIONES AND THEIR DERIVATIVES
A.M. Knyazyan, K.A. Eliazyan, V.A. Pivazyan, E.A.Ghazaryan, A.P. Yengoyan
Armenian-Russian (Slavonic) State University, Armenia

16.00-16.30

- IL 4. ON THE DIASTEREOSELECTIVE OXIDATION OF 8-(4-BROMOPHENYL)-8-ETHOXY-5-METHYL-8H[1,4]THIAZINO[3,4-C][1,2,4]OXADIAZOL-3-ONE: A COMBINED EXPERIMENTAL AND COMPUTATIONAL INVESTIGATION**
A. Bottoni, M. Calvaresi, B. Cosimelli, L. Pisani, E. Severi, D. Spinelli, S. Superchi
Università degli Studi di Bologna, Italy

16.30-16.45

- OP 10. THE MATHEMATICAL MODELING OF SYSTEMS WITH ELECTROPOLYMERIZATION OF HETEROCYCLIC COMPOUNDS ON INERT ANODES IN STRONG ACID MEDIA**
V. V. Tkach, V.V. Nechyporuk, P.I. Yagodynets' and O.T.Slipenyuk
Chernivtsi National University, Ukraine

16.45-17.00

- OP 11. DECARBOXYLATION PHENOMENA OBSERVED DURING THE N-CARBOXYMETHYLATION OF THE PYRIDYLPORPHYRINS**
R. K. Ghazaryan
Yerevan State Medical University, Armenia

17.00-17.15

- OP 12. CYCLOHEXANE ISOMERISATION. UNIMOLECULAR DYNAMICS OF THE TWIST-BOAT INTERMEDIATE**
Kh. Kakhiani, U. Lourderaj, W. Hu, D. Birney, W. L. Hase
Tbilisi State University, Georgia

17.15-17.30

- OP 13. MODIFICATION AND BIOLOGICAL ACTIVITY OF SOME NATURAL COMPOUNDS**
M. Sikharulidze
TSMU, Ivel Kutateladze Institute of Pharmacochimistry, Georgia

17.30-17.45

- OP 14. QUANTUM-CHEMICAL MODELING OF THE MECHANISM OF TAUTOMERISM IN SOME HETEROCYCLIC COMPOUNDS**
J. Kereselidze, M. Kvaraia, Z. Pachulia
Ivane Javakhishvili Tbilisi State University, Georgia

17.45-18.00

- OP 15. SYNTHESIS AND PROPERTIES OF NEW 5(6)-AMINO-2- (1-ADAMANTYL) BENZIMIDAZOLE DERIVATIVES**
D. S. Zurabishvili, T. J. Bukia, M.O.Lomidze, M. V.Trapaidze, E. Elizbarashvili, U. Kazmaier, Sh. A. Samsoniya
I. Javakhishvili Tbilisi State University, Georgia

9.30-10.00

IL 5. POLYMER BASED NANOCOMPOSITE STRUCTURES AND POLYFUNCTIONAL COMPOUNDS

A. Maharramov, M. A. Ramazanov

Baku State University, Azerbaijan

10.00-10.15

OP 16. ABOUT SOME STAGES OF THE MECHANISM OF E.FISHER'S REACTION

I. Chikvaidze, Sh. Samsoniya, D. Kadzhrishvili, N. Barbakadze

Iv. Javakhishvili Tbilisi State University, Georgia

10.15-10.30

OP 17. RESEARCH IN THE FIELD OF ADAMANTANE CHEMISTRY

D. S. Zurabishvili, I. Javakhishvili Tbilisi State University, Georgia

10.30-10.45

OP 18. BIOAVAILABILITY OF SOME BIOLOGICALLY ACTIVE COMPOUNDS FROM GEORGIAN FLORA

L. Tsiklauri, TMSU I. Kutateladze Pharmacochimistry Institute, Georgia

10.45-11.00

OP 19. SYNTHESIS OF b-DIKETONE DERIVATIVES OF 1,3,5-TRIAZINE

K. T. Mahmudov, A. M. Maharramov, R. A. Aliyeva, F. M. Chyragov, M. N.

Kopylovich, A. J. L. Pompeiro

Baku State University, Azerbaijan

11.00-11.15

OP 20. NOVEL 20-MEMBERED POLYAZOMETHINES – A POTENCIAL TARJET COMPOUND FOR NANOTUBES

E. Elizbarashvili, I. Lagvilava, T. Matitaishvili

Georgian Technical University, Georgia

11.15-11.30

OP 21. STEROIDAL GLYCOSIDES FROM THE SEEDS OF *DIGITALIS CILIATA* TRAUTV.

E. Kemertelidze, A. Skhirtladze, A. Perrone, S. Piacente

TSMU, Iovel Kutateladze Institute of Pharmacochimistry, Georgia

11.30-11.45

OP 22. THE SECONDARY METABOLITES OF ASTRAGALUS GENUS AND PERSPECTIVE OF USAGE IN THE MEDICINE

M.D. Alania. TSMU, Iovel Kutateladze Institute of Pharmacochimistry,

Georgia

11.45-12.00

OP 23. ELECTROPHILIC CLEAVAGE OF 3,6a-EPOXYISOINDOLES. SYNTHESIS OF ISOMERIC HEXAHYDRO-1H-ISOINDOLE- 5,6-DIYL DIACETATES

V.P. Zaytsev, E.S. Puzikova, F.I. Zubkov, V.N. Khrustalev, A.V. Gurbanov,

A.M. Maharramov. Peoples' Friendship University of Russia, Russian

Federation

SPEAKERS



Prof. Shota Samsoniya

*Corresponding member of Georgian National
Academy of Science
Tbilisi State University,
Georgia*

Born in Tbilisi (Georgia) on January 24, 1941. He obtained His undergraduate degree in Chemistry from Tbilisi State University in 1963. His Postgraduate and Doctor's degree he obtained in D. Mendeleev Moscow Chemical-Technological Institute in 1964-1967 and 1974-1976 respectively. Assistant at the Chair of Organic Chemistry in TSU (1967-1969) and Assistant Professor at the Chair of Organic Chemistry (1970-1977), he was appointed to the Head of Chair of Organic Chemistry (1978). He had scientific intern at Gutenberg University, Mainz, Germany (1971-1972) and at Saarbrücken University in 1987, 1992, 1993, 1996, 1998, 2003, 2005, 2007, 2009, and 2011.

He has been working in Chemistry of Heterocyclic Compounds, Biologically Active Compounds, Chemistry of Natural Compounds, Photochemistry and also Oil Chemical Synthesis.

Prof. Shota Samsoniya has served chemical society for several years. Scientific Director of the Research Laboratory of Organic Synthesis, TSU (1987-2005), Head of Chair of Organic Chemistry and of Chemistry of Natural compounds in TSU (1990-2006), Scientific Consultant of the National Center of Georgia's Intellectual Property – "Sakpatenti" (1995-2010), Deputy Dean of the Chemistry Trend, TSU Faculty of Exact and Natural Sciences (2006-2007), Head of the Organic Chemistry Trend and TSU full professor since 2006.

In 1967 he received Diploma of the D. Mendeleev All-Union Chemical Society; he was awarded with Petre Melikishvili Prize in 1980 and with Brestplate "Inventor of the Soviet Union" in 1986. He received I. Javakhishvili Medal in 1991 and Medal of Merit in 1998. He was receiving G. Soros Professor Scholarship from 1994 to 1998.

He has published 535 works including 286 papers, 28 books, 18 patents, 203 abstracts of conference papers, supervising 28 candidates' theses, 2 Doctor of chemistry theses and 6 Doctor's of science theses.



Prof. Gevorg G. Danagulyan

*Corresponding Member of Armenian National
Academy of Science,
Institute of Organic Chemistry, NAS RA
Armenia*

Born in Nor-Bayazet /Gavar/ (Armenia) on March 10, 1951. Graduated from Yerevan State University (1973), Ph.D. (1978, Moscow State University), Dr. of Chemical Sciences (2000, Yerevan), Corresponding Member of Armenian National Academy of Science (2010). Professor at the Medical-Biological Department of the Russian-Armenian (Slavonic) State University, Team leader at the Institute of Organic Chemistry of the Scientific Technological Centre of Organic and Pharmaceutical Chemistry of NAS RA. Member of Editorial Board International Journal "Chemistry of Heterocyclic Compounds", Executive editor of "Chemical Journal of Armenia".

Prof. Gevorg Danagulyan has discovered new transformations of pyrimidines into compounds of a pyridine series under the action of nucleophiles. His team is concerned with the research of nucleophilic rearrangements of pyrimidine systems, in particular, those of the Kost-Sagitullin (N-C recyclization), Dimroth (N-N recyclization) rearrangements and C-C-recyclizations. In the course of these studies the rearrangement of 1,2-dialkylpyrimidinium salts proceeding with intrusion of the amine reagent fragment into the molecule of the pyridine derivative formed as a result of the recyclization has been discovered. It is shown that carrying out the reactions under the action of various biogenic and pharmacophore-containing amines makes it possible to purposefully synthesize derivatives of nicotinic acid and nicotinamide containing in position 2 fragments of the reacting biogenic or bioactive amine. The last year's research resulted in finding new, not described in the literature, recyclizational pyrimidine transformations.

The other trend of the teams' research and interests is revealing the objective laws between the compounds structure and their biological activity. In particular, the genotoxic and antineoplastic effects of pyrimidines, containing a bridged nitrogen atom, and of some of their acyclic analogs - potential metabolites, are being studied. The cerebrovascular activity of various synthesized pyrimidines (including the condensed ones) has been studied.

He is author of more than 200 publications on pyrimidine chemistry (Tetrahedron Lett., Heterocycles, J. Heterocyclic Chemistry, Chemistry of Heterocyclic Compounds, Pharmaceutical Chemistry Journal, Cytology and Genetics, Neurochemistry etc.).

Due to the contribution into the Heterocyclic Chemistry in 2010 was rewarded with a diploma of the Moscow State University after M.V. Lomonosov and a golden medal of the "Scientific partnership" International Scientific Foundation.



Prof. Athina Geronikaki

Aristotelian University of Thessaloniki,
Greece

Prof. Geronikaki graduated from Chemical Department of Tashkent State University in 1971. In 1976 she took her PhD in Chemistry of Natural Products. Since this time she was working as a researcher in Institute of Chemistry of Plant Substances of Uzbek Academy of science. In 1982 she finished School of Pharmacy of Aristotle University of Thessaloniki (Greece), where she was working since 1981 as lecturer.

Since 2003 she was associate Professor of Medicinal Chemistry in the same University and from 2011 she is Full professor of School of Pharmacy.

From 2006 till now she is Head of the laboratory of Pharmaceutical Chemistry. In period 2009- 2011 she was Vice Dean of School of Pharmacy.

Prof. Geronikaki has more than 70 papers in peer reviewed journals, more than 200 presentation in International conferences and 5 books for students. She is Editor in Chief of Brazilian Journal of Chemistry and Member of Advisory Board of Jordan Journal of Chemistry.

Prof. Geronikaki organized two International conferences, such as Computational Methods in Toxicology and Pharmacology. Integrating Internet Resources, in 2003 and Eurasian Meeting in Heterocyclic Chemistry in 2006.

She was awarded with silver medal from International Scientific Partnership Foundation for the promotion of international collaboration and her contribution in science, in 2003. In 2010 she was again awarded from the same organization.

Her interest of research area is design, synthesis and elucidation of chemotherapeutically active (antibacterial, antifungal, antiviral, anti-inflammatory, etc) novel heterocyclic agents.



Prof. Domenico Spinelli

University of Bologna,
Italy

Born in Bari (Italy) on May 30, 1932. He obtained his degree in Chemistry magna cum laude from the University of Bari in 1955. Assistant Professor of Organic Chemistry at Universities of Bari (1955-1961) and of Genoa (1962-1968), he was appointed to the Chair of Organic Chemistry at the Faculty of Pharmacy of the University of Sassari in 1968. After one year he moved to the Faculty of Sciences of the University of Palermo and finally (1974) to the Faculty of Pharmacy of the University of Bologna.

For a long time Coordinator of the Ph.D. Courses in Pharmaceutical Sciences and for the Degree in Pharmacy. He has been for some decades Coordinator of several National Research Projects on 'Synthesis and organic reactivity' and on 'Heterocyclic chemistry'.

Domenico Spinelli has served the chemical community for several and several years. Member of Executive Committee (1987-1992) and then President (1993-1995) of the Division of Organic Chemistry of the Italian Chemical Society; Vice-President (1996-1998), President (1999-2001), and past-President (2002-2004) of the Italian Chemical Society. He has been member of the European Committee for European Journals.

In 1974 he received the golden 'Sigillum Magnum' of the University of Palermo, and in the years he was awarded the 'A. Mangini' and the 'D. Marotta' golden medals as well as the golden 'Sigillum' of the Italian Chemical Society. Honorary life member of ISBC (India). Member of the European Academy of Sciences and Arts.

He is author of over three hundred papers (in J. Chem. Soc. Perkin Trans. 1 and 2, Chem. Commun., Tetrahedron and Tetrahedron Lett., J. Org. Chem., J. Phys. Chem. A, J. Am. Chem. Soc., J. Med. Chem., etc.) dealing with the study of the reactivity and properties of several five-membered heterocycles [thiophenes and benzothiophenes (nucleophilic aromatic substitutions); 1,2,4-oxadiazoles and isoxazoles (mononuclear rearrangements of heterocycles); imidazoles and condensed imidazoles (ring-opening-ring closing reactions); 1,3,4-oxadiazoles, 1,3,4-thiadiazoles and thiazoles (decarboxylation reactions); furans and congeners (enolisation processes); etc.]; of the micellar catalysis; of the mutagenic and antitumour properties of nitro compounds; of the pharmacological properties (LTCC blockers and agonist of MDR activity) of thiazinooxadiazolones; etc.



Prof. Abel Maharramov

*Academician
Baku State University,
Azerbaijan*

Born in Azerbaijan on the 5th of January, 1950.

He obtained the degree of Candidate of Sciences in 1976 (Moscow State University) and Doctor of Science degree in 1991.

From 1993 through 1999 he worked as the Dean of the Faculty of Chemistry. In 1999 he was appointed to the position as a Rector of Baku State University.

From 1998 he is the member of the United Research Methodical Council at the Ministry of Education. Since 2000 he is the Chairman of the Academic Board for granting Ph.D and doctoral degrees in the field of organic chemistry at Baku State University.

In 2000 he was awarded the title of "Honored Scientist" and the "Golden Medal" of the Organization of Economic Cooperation which held its meeting in Tehran.

He became the corresponding member (2001), a member (2005) and an active member (2007) of the National Academy of Sciences of Azerbaijan.

He is Honorary Doctorate at Kirikkale University in Turkey, Ovidius University of Romania and honorary member of the Chemical Society of the Republic of Georgia.

In 2002 through 2004 he was elected the President of the Black Sea Universities Network and from 2004 he acted as the Vice-President of the same organization. In 2004 he was awarded the 'Golden Star' COMANDOR level Order of Romania.

He is the author of nearly 1000 research works, including 48 patents, 14 monographs, 41 text books and manuals and he also coauthored the "Small Chemical Encyclopedia" published for the first time in Azerbaijani. The results of his research achievements are reflected in prestigious journals such as Tetrahedron, SulfurLett., Synth.Comunn., The Journal of American Science, Indian Journal of Chemistry, The Journal of Organic Chemistry, "Известия Академии Наук России" (News of the Russian Academy of Sciences-trans.) and others.

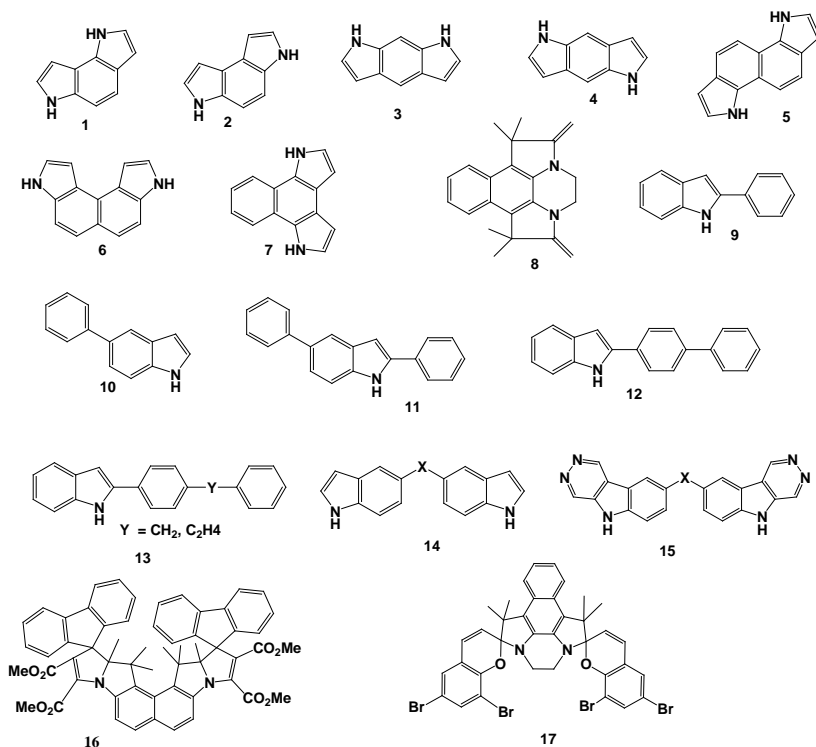
INVITED LECTURES

IL 1. NOVEL HETEROCYCLIC SYSTEMS CONTAINING INDOLE FRAGMENTS. SYNTHESIS, PROPERTIES, ANOMALOUS REACTIONS

Sh. Samsoniya

Iv. Javakhishvili Tbilisi State University, Georgia
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Preparative methods are suggested to obtain novel isomeric heterocyclic systems containing indole fragments (1-8, 15) [1-4], bis-indoles (14) [5-9], 2,5-aryl substituted indoles (9-13) [10] and bis spiro compounds (15, 17) [11-16]:



Condensation in pyrroloindole, indoloindole and bis-indole systems is realized by benzene ring carbon atoms and bridge groups (CH_2 , CH_2CH_2 , O, S, SO_2), respectively. Heterocyclic systems containing two active pyrrol rings with a free β -position are obtained.

Potential bis- and polyanalogs of known physiologically active compounds of indole may be obtained on the basis of the proposed systems. These analogs will have prolongation ability.

Methods of synthesis of bis spiro compounds containing indole fragment are proposed [11-16]. In case of simultaneous opening of two pyran rings a conjugated chain increases significantly and as a result a strong bathochromic shift of the photoinduced absorption band takes place.

Anomalous reactions of electrophilic substitutions revealed while study, and deformation, chlorination and benzene group migration reactions are considered [17-20].

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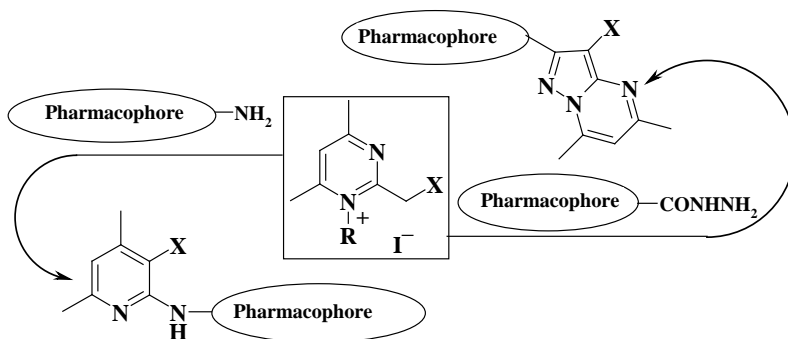
II.2. INTRODUCTION OF PHARMACOPHORE GROUPS VIA REARRANGEMENT OF PYRIMIDINIUM SALTS

G.G. Danagulyan

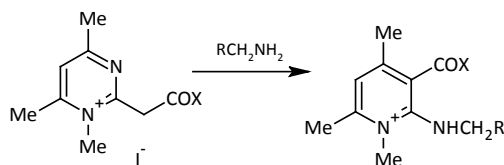
Russian-Armenian (Slavonic) State University, Armenia
gdanag@email.com

The presented review is devoted to original methods of introducing pharmacophore and biogenic groups into molecules of nicotinic acid derivatives and those of condensed system of a series of pyrazolo[1,5-a]pyrimidine. Elaboration of these methods is connected with study and revealing in our laboratory novel nucleophilic recyclizations of 1,4,6-trimethyl-2-(ethoxy-carbonyl/carbamoyl/) methylpyrimidinium iodides proceeding under the action of such nucleophiles as various primary amines and hydrazine derivatives [1-3].

We succeeded in elaboration of two novel original routes for the synthesis of biologically active compounds based on pyrimidinium salts. Schematically it may be presented in the following way:



Rearrangements of 4,6-dimethyl(2-ethoxycarbonyl/carbamoyl/)methylpyrimidinium iodide under the action of various reagents, containing an amine group, have been studied. As a result almost inaccessible 2-alkylaminopyridines are formed that contain a fragment of the amine introduced into the reaction.

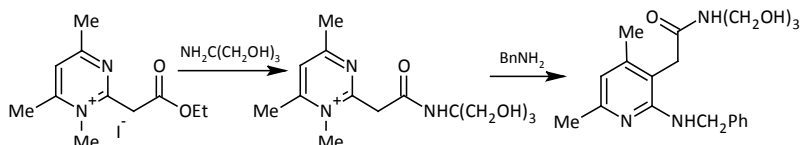


X=OEt, NH₂

R=CH₂OH; CH(OH)CH₃; CH₂CH₂OH; CH₂OEt; CH₃; Ph; C₆H₄-p-OCH(CH₃)₂; CH₂NHCOCH₃
CH₂OC₂H₅; CH₂N(CH₂)₄; CH₂N(CH₂)₅; CH₂N(CH₂CH₂OCH₂CH₂); (CH₂)_nCOOH, (CH₂)_n-Het

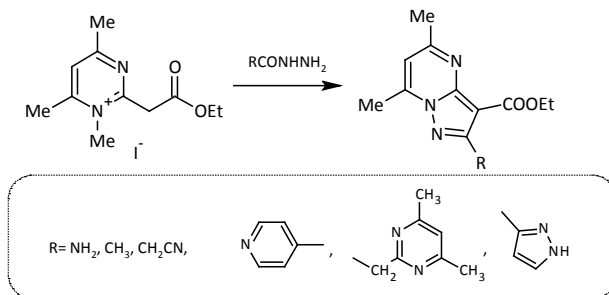
It was shown that while carrying out the reaction in excess of amine and without a solvent the products of "rearrangement with amination" are isolated in high yields.

Upon interaction of salt with tri(hydroxymethyl)aminomethane the volumetric substituent of the latter, connected with the amine group, creates hindrances for the amine attack on the pyrimidine ring. Therefore the amine attack is delivered on the ester group, which results in affording amide. The latter readily rearranged when reacted with benzylamine having a less volumetric substituent. This resulted in obtaining pyridine.



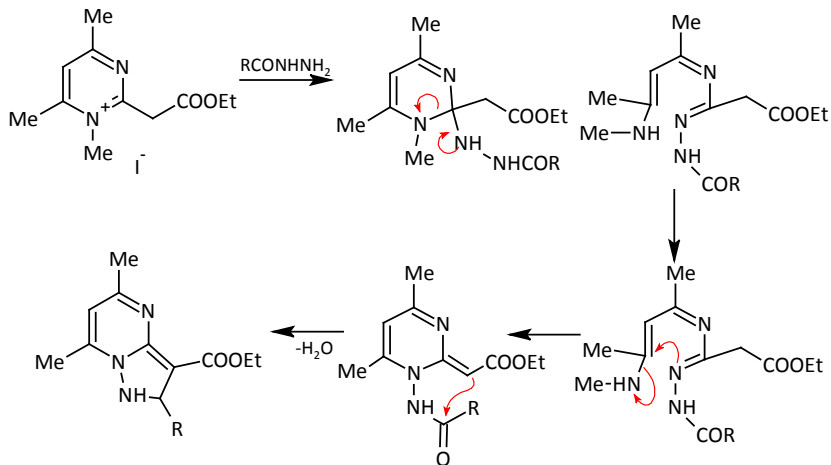
Upon interaction of 1,4,6-trimethyl-2-ethoxycarbonylpyrimidinium iodide with carboxylic acid hydrazides ordinary rearrangement to pyrazolo[1,5-a]pyrimidine derivatives occurs.

The composition of compounds was proved by X-ray structural investigation as well as mass- and NMR spectra.



It is a new not observed earlier rearrangement of 1,2-dialkylpyrimidinium salts

proceeding through the pyrimidine ring recyclization with inclusion of the nucleophilic reagent fragment into the transformation product. The possible scheme of transformation is like this:



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IL 3. NOVEL BENZO[d]THIAZOLIMINO-5-ARYLIDEN-4- THIAZOLIDINONES AS CYCLOXYGENASE/LIPOXYGENASE AND MATRIX METALLOPROTEINASE INHIBITORS. ESTIMATION OF STRUCTURE-ACTIVITY RELATIONSHIP

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Inflammation is a multifactorial process. Although, it is a protective mechanism against physical injuries, pathogenic microorganisms and other factors, it is related to a number of serious and chronic disorders such as asthma and arthritis which require repeated or prolonged treatment. Cyclooxygenase (COX) and lipoxygenase (LOX) enzymes are involved in inflammation response by producing two groups of arachidonic acid metabolites, prostaglandins (COX products) and leucotrienes (LOX products). Non-steroidal anti-inflammatory drugs (NSAIDs), act via the inhibition of cyclooxygenase isoenzymes (COX-1, COX-2). Although COX-2 is concerned to be the main isoenzyme related to inflammation, most NSAIDs block both forms of COX enzyme. Since, COX-1 or COX-2 inhibition has been associated with side effects such as gastrointestinal or cardiovascular problems, balanced inhibition of COX-1/2 isoenzymes combined with LOX inhibition seems to be the choice of preference for some scientists. Matrix metalloproteinases (MMP) are involved in tissue degradation and remodeling, which they achieve by hydrolyzing extracellular matrix components, such as all forms of collagen, gelatin and elastin. In osteoarthritis the overexpression of MMP-13, or the misregulation of its activity, is related to disease progression. Therefore many efforts have been devoted to develop inhibitors against this metalloenzyme. The inhibitory capability of a new class of 4-thiazolidinone derivatives towards MMP-13 has been investigated by evaluating their ability to prevent the hydrolysis of the fluorescent-quenched peptide substrate Mca-Pro-Leu-Gly-Leu-Dpa-Ala-Arg-NH₂.

Various thiazole and thiazolidinone [1, 2] derivatives, synthesized by our team have been found to have LOX as well as COX inhibitory action. Recently, a number of 2-thiazolylimino-5-arylidene-4-thiazolidinones were evaluated for dual COX/LOX inhibitory action [1]. In an effort to produce compounds with higher LOX and COX inhibition, twenty seven benzothiazolylimino-5-arylidene-4-thiazolidinone derivatives were synthesized and evaluated for their activity.

All new compounds had improved LOX inhibitory activity compared to the 2-thiazolylimino-5-arylidene-4-thiazolidinone analogues. Some of the compounds exhibited better COX inhibition as well. In order to analyze the mode of binding of different derivatives, docking studies for selected compounds were performed. The metalloproteinase inhibition constants as (K_i) measured for the investigated compounds

range from 18 to 142 μM . These preliminary results suggest a possible use of the 5-heteroarylimino-4-thiazolidinone scaffold to develop new inhibitors of the MMP-13.

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IL 4. ON THE DIASTEREOSELECTIVE OXIDATION OF 8-(4-BROMOPHENYL)-8-ETHOXY-5-METHYL-8H[1,4]THIAZINO[3,4-C][1,2,4]OXADIAZOL-3-ONE: A COMBINED EXPERIMENTAL AND COMPUTATIONAL INVESTIGATION

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D. Spinelli,¹ S. Superchi³

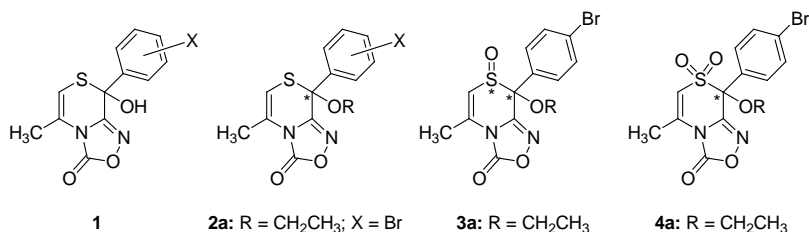
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Recently we have observed that various 8-aryl-8-hydroxy-5-methyl-8H[1,4]thiazino[3,4-c][1,2,4]oxadiazol-3-ones (**1**) [1] and 8-alkoxy-8-aryl-5-methyl-8H[1,4]thiazino[3,4-c][1,2,4]oxadiazol-3-ones (**2**) [2] show an interesting activity as LTCC (L-type calcium channel) blockers. This activity is observed in some cases at nanomolar concentration. Among these species the most powerful one is 8-(4-bromophenyl)-8-ethoxy-5-methyl-8H[1,4]thiazino[3,4-c][1,2,4]oxadiazol-3-one (**2a**): [2b] in particular its *R*(-)-enantiomer shows a high and selective negative inotropic potency (EC_{50} 0.07 μ M), which makes this compound one order of magnitude more potent than diltiazem (DTZ).

Moreover in a parallel investigation we have observed that some compounds of type **1** and **2** are promising inhibitors of MDR1 activity.[3]



To obtain information on the potential activity of sulphides **2**, eventually with the help of virtual screening procedures, we have examined the behavior of **2a** (racemic mixture: C-8 adjacent to sulfur is a chiral center) with some oxidants and we have observed that a high diastereoselectivity can characterize the oxidation process.

The separation of the relevant sulphoxide **3a** (some sulphone **4a** have also been obtained) by chiral chromatography in its stereoisomers has allowed the assignment of the relative and absolute configuration by computational analysis of their ECD spectra.[4] Furthermore, we have carried out a computational DFT investigation of the mechanism of this oxidative process. [5] The comparison between the results of 'in-laboratory-chemistry' and 'in-silico-chemistry' has provided useful information on many mechanistic aspects [6] (π - π stacking interactions) which can be essential

to determine the optimum conditions favoring chemical yields of the oxidation reaction of sulphides **2** and its stereoselectivity.

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IL 5. POLYMER BASED NANOCOMPOSITE STRUCTURES AND POLYFUNCTIONAL COMPOSITES

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It is well known that the properties of nanodimensional particles differ from the properties of macroparticles. By preparing composite materials that comprise nanoparticles and by controlling the sizes and the form of the nanostructures, it is possible to enrich these composites with entirely new functional characteristics (optical, magnetic, and mechanical) that differ from the properties of conventional materials. Recently, many studies concerned with various aspects of obtaining polymer composite materials with luminescence properties have been carried out. Semiconductor materials in the form of clusters distributed in an organic polymer matrix have been the subjects of intense interest of researchers working in the domain of physics and chemistry of low-dimensional systems for some time.

The main aim of this research work is the synthesis and characterization of nanocomposites by new technologies based on polyfunctional composites. We have been used the different functional natural carbohydrates for the synthesis of new nanocomposites such as superparamagnetic nanoparticles. The synthesis technology of water-soluble polyaniline, polymethacrylic acid, polynitroaniline nanocomposites, organic selenium nanoparticles (20-30 nm) to synthesize of diene compounds, the use of ZnO nanoparticles for the methoxycarbonylation and kinetic of toluene diamine and dimethyl carbonate have been studied. In the next part of this research, we have been studied the relation of polymer and different drugs such as 5- aminosalicylic acid (5-ASA) or mesalamine as drug delivery systems. For the first time, we have been used the iron oxide superparamagnetic nanoparticles coated with aminodextran molecules. These nanocomposites can be carry of CREKA paptides and drug molecules. The polyaniline/polymethacrylic acid/SiO₂ nanocomposites have been synthesized and the electric and magnetic properties of their mixtures with polyurethane resin have been studied.

ORAL PRESENTATIONS

OP 1. MULTI-COMPONENT SYNTHESIS OF N-HETEROCYCLES IN DEEP EUTECTIC SOLVENTS

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In the context of green chemistry, the design and development of sequences allowing highly selective access to elaborated molecular scaffolds while combining structural diversity with eco-compatibility are great challenges for organic chemists. Multi-component reactions (MCRs) are one of the oldest fields in organic chemistry, allowing for the rapid and efficient assembly of a great number of scaffolds. They hold a privileged position among the synthetic strategies in terms of efficiency, particularly regarding the preparation of a library of molecules or in diversity-oriented synthesis. The additional benefits to this process are the readily available starting materials, operationally simple, easily automatable, resource effective, atom economy and ecologically benign, with minimization of reaction time, labor, cost, and waste production [1].

In recent years, utilization of room-temperature ionic liquids (RTILs) in organic synthesis and industry have received great attention due to their unusual properties compared with traditional molecular solvents, such as undetectable vapor pressure, wide liquid temperature range, special solubility for many organic or inorganic compounds, and favorable environments. A closely related class of solvents with physical properties and phase behaviors very similar to those of RTILs are room temperature deep-eutectic solvents (DESS), which were developed by Abbott and co-workers.[2] These eutectic mixtures are attractive alternatives to RTILs, as DESSs can be less expensive, more synthetically accessible, nontoxic, and biodegradable. Lastly, the coupling of two or more green technologies within a single process is a better approach to sustainability than reliance on a single technological opportunity. The goal can be achieved by developing new multi-component reactions in deep eutectic solvent. This is the aim of this presentation to show the advantages of using these two techniques together for the synthesis of N-heterocycles such as pyridine, dihydropyridine, imidazole and pyrrole under mild reaction condition.

References

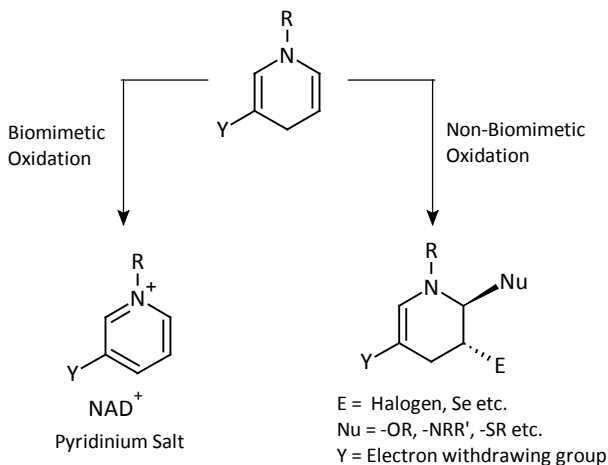
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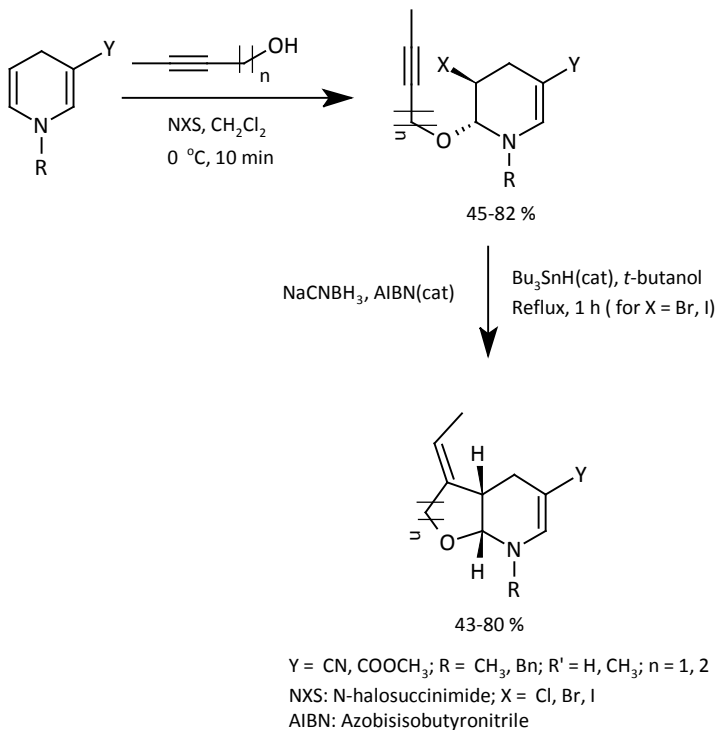
**OP 2. STEREOCONTROLLED NON-BIOMIMETIC OXIDATIVE ADDITIONS
UPON 1,4-DIHYDROPYRIDINES: SYNTHESIS OF BICYCLIC
HETEROCYCLIC COMPOUNDS BY SEQUENTIAL ENAMINE
REACTION AND FREE RADICAL CYCLISATION**

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Continuing our research on the development of new transformations of 1,4-dihydropyridines, we have recently described some 'non-biomimetic' oxidations of these compounds[1-3], in which the normal production of the corresponding pyridinium salt is avoided. The methodology represents a new synthetic entry to a wide range of functionalized tetrahydropyridines stereoselectively as potential precursors of bioactive or natural products such as azasugars. This methodology also affords bicyclic heterocyclic systems of pharmaceutical importance.





References

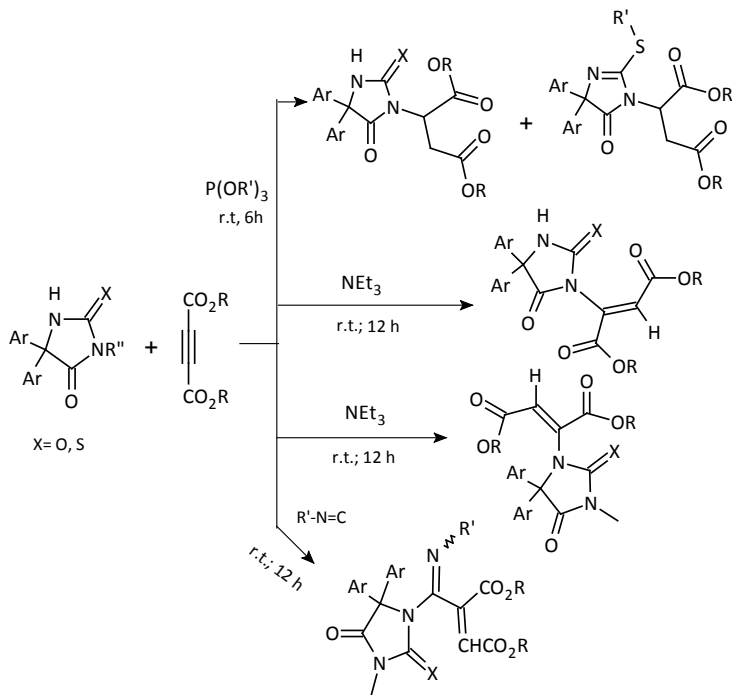
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OP 3. SYNTHESIS OF NEW HYDANTOINS AND THIOHYDANTOINS

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Several classes of drugs are based on the imidazole ring system. 5,5-diphenyl-2-thiohydantoin derivatives contained in vascular endothelial cells have anti-proliferation function [1]. Hydantoin and thiohydantoin are known to exhibit a wide range of biological activities, including anticonvulsant, antiarrhythmic, anti-inflammatory, and antidiabetic properties, as well as herbicidal and fungicidal activity[2] The formation of a carbon-nitrogen bond is of importance for the synthesis of nitrogen-containing natural products and biologically active systems[3] As part of our current studies on the development of new routes in heterocyclic synthesis,[4] We now report an efficient one-pot synthesis of new Hydantoin and Thiohydantoin.



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OP 4. SYNTHESIS OF HETEROCYCLES ON THE BASE OF ADDUCTS OF IODINEALKOXYLATION OF N-VINYL DERIVATIVES OF PYRROLIDONE AND PHTHALIMIDE

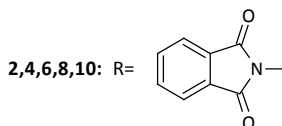
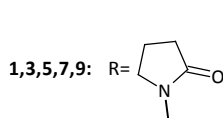
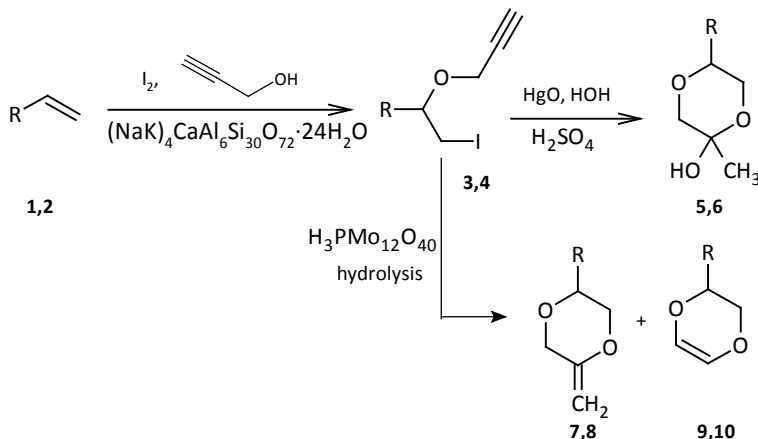
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The acetylene halogen ethers are widely used in organic synthesis [1-3] and for production of biologically active compounds [4].

In development of chemistry and application of heteroatom acetylene compounds [1-5] the results of joint iodination of propargyl alcohol and N-vinyl derivatives of pyrrolidone and phthalimide are considered in present report.

It have been determined that iodinealkoxylation of 1-vinyl-2-pyrrolidone (1) or N-vinyl-phthalimide (2) by crystalline iodine with share of propargyl alcohol and clinoptylolite $(\text{NaK})_4\text{CaAl}_6\text{Si}_{30}\text{O}_{72}\cdot 24\text{H}_2\text{O}$ proceeds regioselectively with formation of adducts – propargyl iodine ethers (3,4). The 1,4-dioxane (5,6) derivatives have been ensued from catalytic hydration of the lasts, and small amount of the 3-methylene-1,4-dioxane (7,8) and heptamers heterocycles (9,10) – from hydrolysis over a phosphorusmolybdenum heteropolyacid.



The chemical composition of the educed compounds (3-10) has been corroborated by element analysis; their structure has been proved by dates of nuclear magnetic resonance (NMR) spectrum and infrared spectroscopy.

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**OP 5. ALKALOIDS- CONTAINING PLANT SPECIES OF GEORGIA FLORA AS
SOURCES OF PHARMACOLOGICALLY ACTIVE ALKALOIDS**

**V.U. Vachnadze¹, L.G. Kintsurahvili¹, T.Sh. Suladze¹, N.S. Vachnadze¹,
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The flora of Georgia has been studied with the aim of finding the alkaloid-containing plant species. Positive results were obtained in 400 analyses. The 32 species were first classified as alkaloid-containing ones

Thorough chemical investigation of more than 50 plant species was carried out. It was established that, in Georgian flora, there are found alkaloids of practically all chemical classes: aliphatic, belladine, isochinoline, indole, colchicine, pyridine, pyrrolisidine, steroid, terpene, chinasoline, chinalysidine and chinoline.

The 135 individual bases were extracted and indentified. Among them, for 30 new compounds, the corresponding structure was defined.

The phyto investigation of Georgian flora evidenced 400 species of alkaloid containing plants. According to productivity and composition of biologically active compounds, the following families need to be highlighted: Amaryllidaceae, Buxsaceae, Fabaceae, Liliaceae, Ranunculaceae, Taxaceae, Zygophyllaceae.

Perspective drugs based on indolic, izochinolin, taxol alkaloids are developed and proposed with antiarythimic, anticancer activity and as stimulator of leucopoiesis and brain circulation furthermore.

According to pharmacological investigations some of steroid and oxindole alkaloids increases the growth of cancer cells and increase the proliferation of fibrocytes in cell culture.

Chinazoline and buxan alkaloids have shown antihistamine and anticholinesterase activity.

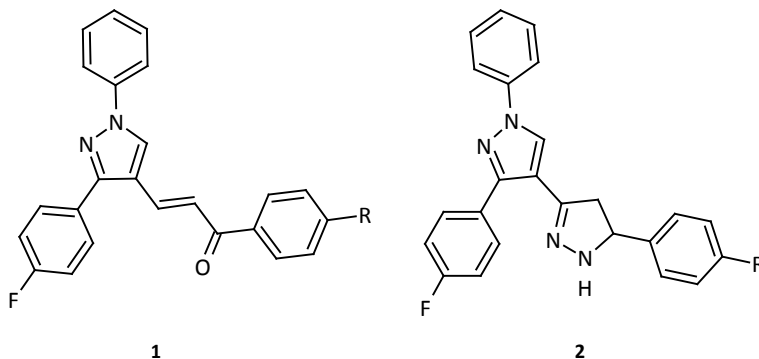
Original phytotechnologies for receipt of drugs are developed based on extraction with diluent gas from raw material of plant origin and fractioning by microfiltration on membrane equipment.

**OP 6. GREEN SYNTHESIS AND ANTI-TB ACTIVITY OF FLUORINATED
PYRAZOLINE DERIVATIVES**

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In the present investigation, a series of 3-(4-fluorophenyl)-4-(4,5-dihydro-5-(4-substitutedphenyl)-1H-pyrazol-3-yl)-1-phenyl-1H-pyrazoles **2** were synthesized by the reaction between hydrazine hydrate and chalcones **1** using sonochemical technique. Newly synthesized compounds were tested for their in vitro anti-tubercular activity against Mycobacterium Tuberculosis H37Rv using the L. J. Slope method (Conventional). All synthesized compounds have been characterized by IR, PMR, CMR and Mass spectral study and also screened for their antimicrobial activity. Among the synthesized compounds, compound (3-(3-(4-fluorophenyl)-1-phenyl-1H-pyrazol-4-yl)-1-p-tolylprop-2-en-1-one and 3-(4-fluorophenyl)-4-(5-(4-fluorophenyl)-4,5-dihydro-1H-pyrazol-3-yl)-1-phenyl-1H-pyrazole was found to be more active agent against M. Tuberculosis H37Rv.



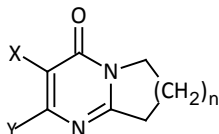
**OP 7. INFLUENCE OF THE NATURE OF SUBSTITUENT ON REACTIVITY OF
2,3-POLYMETHYLENE-3,4-DIHYDROQUINAZOLINE- AND -
THIENO[2,3-D]-PYRIMIDINE-4-ONES IN REACTIONS WITH
CARBONYL COMPOUNDS**

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We have studied the reactions of 2,3-polymethylene-3,4-dihydroquinazoline- and -thieno[2,3-d]-pyrimidine-4-ones and their derivatives with aldehydes and new arylidene derivatives have been synthesized.

Continuing of these investigations, we carry out the reaction of 2,3-polymethylene-3,4-dihydroquinazoline- and -thieno[2,3-d]-pyrimidine-4-ones with aliphatic, aromatic and heterocyclic aldehydes and ketones in various conditions (acid or base medium, various temperature schedules, durations of reactions)



X=H, Y=CH₃

X+Y = (CH=CH)₂

X + Y = C(CH₃)=C(CH₃)-S

n=1-3

Factors influencing to the obtaining of the α -arylidenederivatives will be discussed.

The reactions of acylation of these substrates on studying with acid chlorides, resulting depending on various factors to N-benzoylpyrimidinone-4-iy chloride, α -mono-acyl- or α -acyloxymethylidenederivatives will be given.

OP 8. FLAVONOID GLYCOSIDES OF SOME PLANTS FROM GEORGIAN FLORA AND THEIR BIOLOGICAL ACTIVITY

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Urtica dioica L. (Urticaceae L.) and species of genus *Trifolium* L. are widespread in Georgian flora; by chemical and morphological studies of stinging nettle populations it was established new variety - *Urtica dioica* L. var. *rubescens*. The new anthocyan glycosides (Urticyanines 1-3) derivatives of pelargonidin have been isolated from the overground parts of abovementioned plant[1]. The sum of anthocyan showed high antioxidant activity (157%) in vitro and hypoglycaemic effect in vivo assays [2, 3].

The profound studies on the flavonoids of *Trifolium ambiguum* Bieb., *T. repens* L., *T. hybridum* L., *T. spadiceum* L., *T. fragiferum* L., *T. trichocephalum* Bieb., *T. angustifolium* L., *T. arvense* L. were carried out. It was singled out and identified 14 individual compounds [4]. The flavonoid glycosides robinin and dracocephaloside were isolated for the first time from the genus *Trifolium* L. Robinin and hyperin exhibit high antiuremic and diuretic effects. The sums of flavonoids from *T. trichocephalum* and *T. hybridum* showed spasmolytic and gonadotropin stimulating effects respectively.

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OP 9. SYNTHESIS AND PESTICIDAL ACTIVITY OF 3-ALKYL-4-METHYL5-(5-THIOXO-1,2-DIHYDRO-[1,2,4]TRIAZOL-3-YL)-3H-THIAZOLE-2-THIONES AND THEIR DERIVATIVES

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In the last few decades, the chemistry of 1,2,4-triazoles and thiazoles and also their mercapto- and thione-substituted systems has received considerable attention owing to their synthetic and effective biological importance. The 1,2,4-triazole and thiazole cycles are associated with diverse pharmacological activities such as anti-bacterial, antiviral, anticancer, antitubercular, antifungal, hypoglycemic, antihypertensive, anti-inflammatory, antidepressant and analgesic properties [1-13]. There are known medicines, plant protection and growth regulating materials containing 1,2,4-triazole and thiazole rings. At the same time the great practical interest is the synthesis of compounds with combination of two heterocycles that can lead to the appearance of new physiological properties. In addition, at prolonged use of medicines and pesticides, a resistance of pathogens and pests occurs against these substances, which requires the permanent updating of medicines and pesticides arsenals. The purpose of the present research was to synthesize a new series of compounds, which molecules contain directly connected to each other 1,2,4-triazole and thiazole cycles, wide functionalization of these heterocycles and study of physiological activity of synthesized compounds.

At boiling of mixture of thiosemicarbazides (**1,2**) and KOH solution (in molar ratio of 1:1.6) for 3 h, the cyclization process is occurred with 1,2,4-triazole ring formation (**3,4**). The resulting compounds may exist in thiol and thionyl tautomeric forms. The appearance of peaks at 166-167 ppm in ¹³C NMR spectra of compounds **3,4**, corresponding to C=S bond, agree with thion structure.

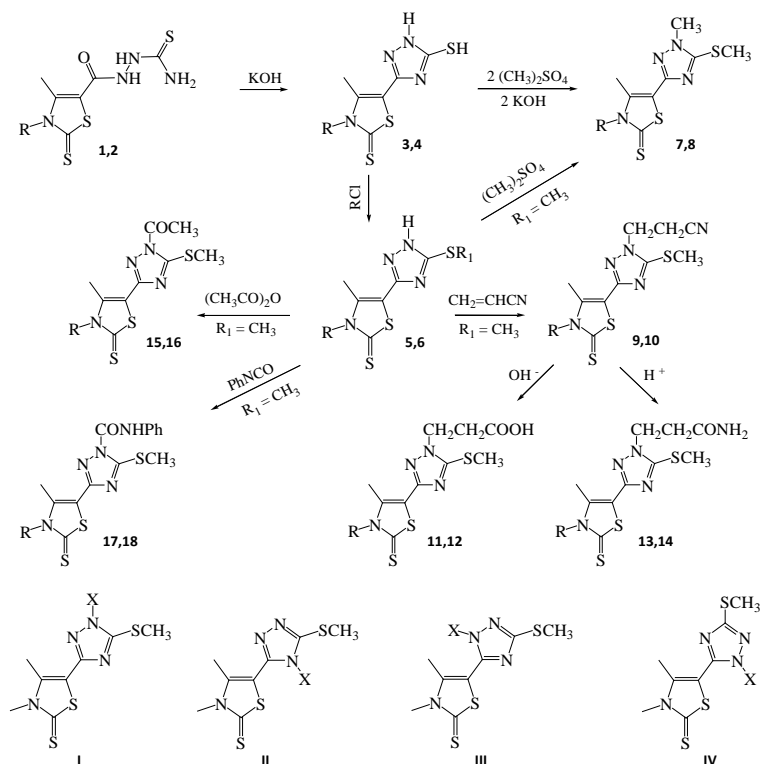
At room temperature in water in the presence of alkali under the action of alkylating agents from compounds **3,4** the corresponding 5-sulfanyl derivatives (**5-8**) are formed. Previously we have shown that in similar systems at alkylation exclusively S-substituted products were formed [14,15]. In the case of synthesized compounds (**5,6**) for the benefit of S-replacement the chemical shifts of NH (13.20-14.36 ppm) and S-alkyl groups in ¹H NMR spectra, and also disappearance of peaks in the range of 166-167 ppm (C=S) in ¹³C NMR spectra are testified.

In obtained compounds the substitution reactions may already take place at one of nitrogen atoms of triazole ring. Selected from this series methylsulfanyl derivatives (**5a,6a**, R₁ = CH₃) under the action of acrylonitrile form compounds **9,10**. As a result

of acid and alkaline hydrolysis of these compounds the corresponding 2-N-propionic acids (**11,12**) and their amides (**13,14**) are obtained. By the interaction of compounds **5a,6a** with acetic anhydride and phenylisocyanate also products of N-substitution (**15,16** and **17,18**) are formed.

In the case of compounds **7-18**, the basic question is at which position of triazole ring the substitution reactions occur (I-III). Chemical shifts of carbon atoms were compared with the corresponding data, given in [16]. In ^{13}C NMR spectra of the synthesized compounds the signals of C3 carbon atom was observed in the range of 155.1–160.3 ppm. These data are in agreement with structure III.

In compounds **5-18** two heterocycles cannot be coplanar, because of steric interactions. In NMR spectra, in NOE conditions the spatial interaction between the 4-CH₃ and N-R substituents is not registered. These data indicate that for molecules **5-18** the structure IV is realized.



The biological screening indicates that synthesized compounds show

simultaneously expressed fungicidal and grow stimulant activity.

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**OP 10. THE MATHEMATICAL MODELING OF SYSTEMS WITH
ELECTROPOLYMERIZATION OF HETEROCYCLIC COMPOUNDS ON
INERT ANODES IN STRONG ACID MEDIA**

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For the last four decades an increasing interest has been posed to the conductive polymers (CP) being capable to combine the tough, flexibility, resiliency in shaping and corrosion resistance of plastics with metal conductivity.

The CP can be synthesized on the base of alkynes (polyacetylene), arenes (poly-*p*-phenylene) and their derivatives (polyaniline) and also 5- and 6-membered heterocyclic compounds (with either fused or lone rings). [1]

The CPs synthesized by electropolymerization of heterocyclic compounds are flexible in its synthesis (we can polymerize them either chemically or electrochemically), properties (we can change the polymer properties changing the synthesis conditions) and use (they can be used in sensors (including ion-, substituent- and enantioselective electrodes, biosensors (including nanoscaled biosensors), capacitors, electrochemical devices and circuits etc).[2]

We have to choose the right conditions of synthesis if we want to give the polymer the desired properties. Generally the acid media favours the electropolymerization, but if the media is strongly acid, the electropolymerization encounters many difficulties due to possible acidophobicity of the monomer and proton effect on the polymerization process (including the formation of passive form of the resulting polymer). [3] These difficulties manifest themselves in electrochemical instabilities, the presence of which is generally not favourable in this process.

To explain these instabilities we have to create the mathematical model, capable to describe them adequately in terms of the most probable mechanism of this process.

To describe this system mathematically we introduce 3 variables

- C_m – the heterocyclic monomer concentration in diffusion layer
- Θ_m – the heterocyclic monomer coverage
- H – proton concentration in diffusion layer.

We can show that the behaviour of this system in potentiostatic mode (being the most frequently used) can be described by next equation system:

$$\begin{cases} \frac{dc_m}{dt} = \frac{2}{\delta} \left(\frac{D}{\delta} (c_b - c) + v_d - v_a - v_{ads} \right) \\ \frac{d\Theta_m}{dt} = \Gamma_{\max} (v_{ads} - v_d - v_p) \\ \frac{dH}{dt} = \frac{2}{\delta} \left(\frac{D}{\delta} (h_b - h) + v_p - v_a \right) \end{cases}$$

In which δ stands for diffusion layer thickness, c_b and h_b are monomer and proton bulk concentrations, D stands for the diffusion coefficient, v_{ads} and v_{des} stand for the adsorption and desorption rates, v_p stands for the polymerization rate (according to the mechanism of Diaz), v_a stands for the side reaction related with monomer acidophobicity.

The stable steady-states conditions were obtained using the Rauss-Gurwitz criterion. The oscillatory behavior in this system can be caused by attractive adsorbate-adsorbate interaction, anodic oxidation of strong reductants formed while the polymerization process and also by autocatalytic proton formation (because protons are expelled from the polymer chain during the polymerization).

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OP 11. DECARBOXYLATION PHENOMENA OBSERVED DURING THE N-CARBOXYMETHYLATION OF THE PYRIDYLPORPHYRINS

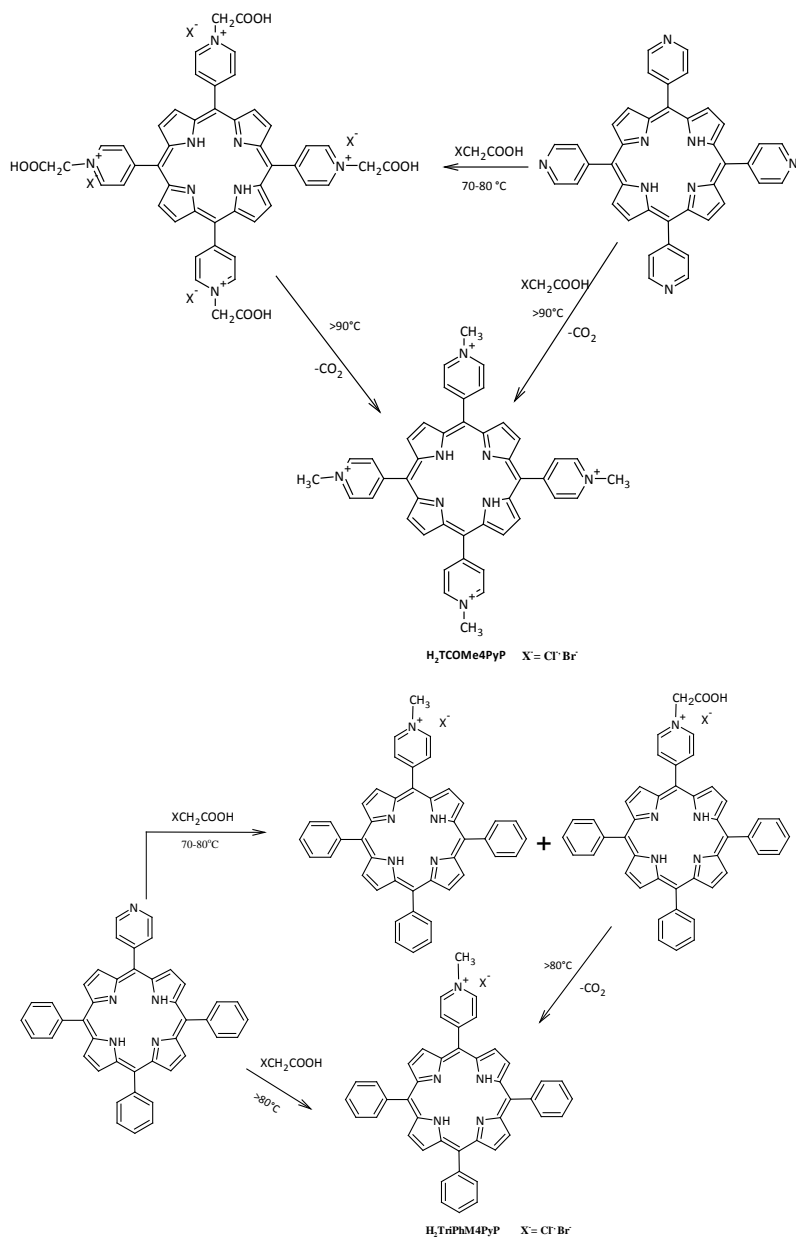
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Studying the bioactivity of cationic (metallo)porphyrins against harmful microorganisms, malignant tumors, replication of a human immunodeficiency virus, etc, has accelerated greatly within the last few decades. Therefore, developing a simple and convenient method for the synthesis of cationic metalloporphyrins with various functional groups is a major challenge in scaling up the drug preparation. In this study we explored the various aspects of the quaternization of 4-N-pyridyl-phenylporphyrins in the course of its N-carboxymethylation employing NMR spectroscopy. 5,10,15-triphenyl-20-mono-(4-N-pyridyl)porphine ($H_2TriPhM4PyP$); 5,15-diphenyl-10,20-di-(4-N-pyridyl)porphine (*trans*- $H_2DiPhDi4PyP$); 5,10,15,20-tetra-(4-N-pyridyl)porphine (H_2T4PyP) were used for investigation of the quaternization procedure by chloroacetic and bromoacetic acids. Acetic and propionic acids and N, N'-dimethylformamide (DMF) were used as solvents for the reaction.

The quaternization of porphyrins under refluxing condition in DMF does not always lead to the targeted N-carboxymethyl products with either chloroacetic or bromoacetic acids. NMR helped us to identify those N-methyl derivatives alone or mixed with N-carboxymethylated compound were obtained in the course of reaction, as a result of decarboxylation of the quaternized compounds. We have determined the optimal reaction conditions to obtain the 5,10,15,20-tetra-(4-N-carboxymethylpyridyl)-porphine ($H_2TCOMe4PyP$) quantitatively by interaction of H_2T4PyP with bromoacetic acid in DMF at 70-75°C. Quaternization of $H_2TriPhM4PyP$ leads to the mixture of N-methyl and N-carboxymethyl derivatives at under similar conditions. 5,10,15,20-tetra-(4-N-methylpyridyl)porphine ($H_2TMe4PyP$) could be obtained in quantitative yield by boiling H_2T4PyP with bromoacetic acid in DMF. $H_2TMe4PyP$ was also the quantitative decarboxylation product of $H_2TCOMe4PyP$.

In 1H NMR spectra of tetra-N-methyl derivatized porphyrins the signal of N^+-CH_3 protons is at 4.74 ppm, whereas the signal of protons in tetra- N^+-CH_2- group is at 5.95. Both signals were registered in the 1H NMR spectrum of compound received by quaternization of porphyrin at 90-95 °C in DMF for 3 hours. In ^{13}C NMR spectra the signals of N^+-CH_3 and N^+-CH_2- groups appeared at 47.6 and 60.4 ppm, accordingly. The reference of the signals to methyl and methylene groups was made on the basis of DEPT spectra.



Porphyrin	Registered N-substituent	NMR		Reagent	t, °C	Time (h)
		¹ H	¹³ C			
H ₂ T4PyP	N ⁺ -CH ₃	4.74	-	ClCH ₂ COOH	boiling	2
				BrCH ₂ COOH	boiling	2
H ₂ T4PyP	N ⁺ -CH ₃	4.74	47.6	BrCH ₂ COOH	90-95	3
	N ⁺ -CH ₂ -	5.94	60.4			
H ₂ T4PyP	N ⁺ -CH ₂ -	5.95	-	BrCH ₂ COOH	70-75	4
<i>Trans</i> - H ₂ DiPhDi4PyP	N ⁺ -CH ₃	4.70	-	BrCH ₂ COOH	boiling	2
				ClCH ₂ COOH	boiling	2
H ₂ TriPhM4PyP	N ⁺ -CH ₃	4.69	47.7	ClCH ₂ COOH	boiling	2
H ₂ TriPhM4PyP	N ⁺ -CH ₃	4.7	-	BrCH ₂ COOH	70-75	4
	N ⁺ -CH ₂ -	5.26	-			

1. Carboxymethylation of pyridylporphyrins (H₂TriPhM4PyP, *trans*-H₂DiPhDi4PyP, H₂T4PyP) by chloro- and bromoacetic acids in DMF at refluxing leads to the corresponding N⁺-CH₃ derivatives.
2. Interaction of H₂T4PyP with bromoacetic acid at 90-95 °C in DMF leads to the mixture of N⁺-CH₂COO⁻ and N⁺-CH₃ quaternized products with a privilege of N⁺-CH₂COO⁻ species.
3. Only N⁺-CH₂COO⁻ derivatives were obtained during the quaternization of H₂T4PyP by bromoacetic acid at 70-75 °C in DMF.
4. The mixture of N⁺-CH₂COO⁻ and N⁺-CH₃ quaternized products (with a privilege of N⁺-CH₂COO⁻ species) are formed in the course of carboxymethylation of H₂M4PyTriPhP in the condition described above (by bromoacetic acid, at 70-75 °C, in DMF).
5. Decarboxylation is happening during the heating of the solution of all N⁺-CH₂COO⁻ quaternized compounds above 80 °C leading to N-methylated products.
6. Pure N-tetra-carboxymethylpyridyl and N-tetra-methylpyridylporphyrins is possible to obtain depending on the conditions of the N-quaternization of H₂T4PyP by halogenacetic acids.
7. Decarboxylation reaction of N-carboxymethyl derivatives of pyridylporphyrins has been revealed.

OP 12. CYCLOHEXANE ISOMERISATION. UNIMOLECULAR DYNAMICS OF THE TWIST-BOAT INTERMEDIATE

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Direct dynamics simulations were performed at the HF/6-31G level of theory to investigate the intramolecular and unimolecular dynamics of the twist-boat (TB) intermediate [1] on the cyclohexane potential energy surface (PES). Additional calculations were performed at the MP2/aug-cc-pVDZ level of theory to further characterize the PES's stationary points. The trajectories were initiated at the C1 and C2 half-chair transition states (TSs) connecting a chair conformer with a TB intermediate, via an intrinsic reaction coordinate (IRC). Energy was added in accord with a microcanonical ensemble at the average energy for experiments at 263 K. Important nontransition state theory (TST), non-IRC, and non-RRKM dynamics were observed in the simulations. Trajectories initially directed toward the chair conformer had a high probability of recrossing the TS, with approximately 30% forming a TB intermediate instead of accessing the potential energy well for the conformer. The TB intermediate initially formed was not necessarily the one connected to the TS via the IRC. Of the trajectories initiated at the C2 half-chair TS and initially directed toward the chair conformer, 35% formed a TB intermediate instead of the chair conformer. Also, of the trajectories forming a TB intermediate, only 16% formed the TB intermediate connected with the C2 TS via the IRC. Up to eight consecutive TB → TB isomerizations were followed, and non-RRKM behavior was observed in their dynamics. A TB can isomerize to two different TBs, one by a clockwise rotation of C–C–C dihedral angles and the other by a counterclockwise rotation. In contrast to RRKM theory, which predicts equivalent probabilities for these rotations, the trajectory dynamics show they are not equivalent and depend on whether the C1 or C2 half-chair TS is initially excited. Non-RRKM dynamics is also observed in the isomerization of the TB intermediates to the chair conformers.

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OP 13. MODIFICATION AND BIOLOGICAL ACTIVITY OF SOME NATURAL COMPOUNDS

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In order to reveal new biologically active compounds, in recent years intensively develops studies of connection pharmacophore groups to natural compounds molecules. It is also very interesting to study the mutual influence of fragments biological activity that is constituents of various biostructures, formed into one molecule.

Searching for the new possibilities, for receiving physiologically active compounds from the natural steroidal source – tigogenin (plant "Yucca gloriosa") and from alkaloid cytisine – exuded from in Georgia cultivated plant "Spartium juncum L", is important and topical task.

Consistence transformation of the product - 3 β -acetoxy-5 α -pregn-16-en-20-one, received after splitting tigogenine without autoclave, is synthesized saturated and unsaturated mono and diketones with A core of androstane and pregnane series. Based on them is received nicotinoil and izonicotinoil hydrazones, indol fragment containing steroids.

It is studied the possibilities of receiving steroidal pirazolines from acetate pregnenolone. For the first time, on the basis of alkaloid cytisine are synthesized biostuctures containing the fragments of antraquinone, adamantane and indole.

It is studied the antitubercular and antiviral activity of the synthesized compounds. Some of them are candidates for further study. On the basis of screening results it is showed the relationship between the biological activity and structure.

In the report partially are used materials of the project financed by Shota Rustaveli National Science Foundation (GNSF/ST08/4-406).

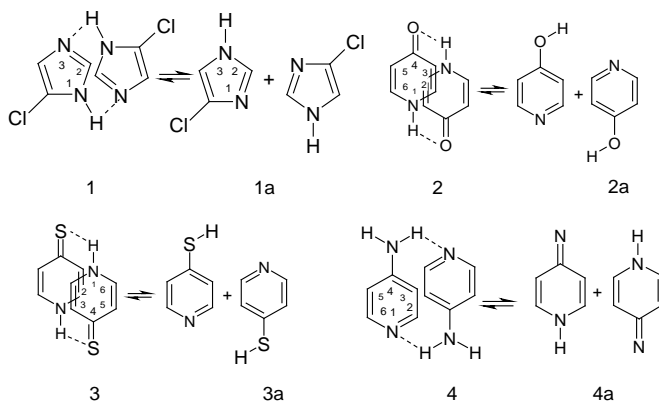
OP 14. QUANTUM-CHEMICAL MODELING OF THE MECHANISM OF TAUTOMERISM IN SOME HETEROCYCLIC COMPOUNDS

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The mechanism of a protons transfer in process of prototropic tautomerism was studied with its opening and is established, that it has intermolecular nature. More often protons are transferred by use of the cyclic - dimeric mechanism, however were applied also three - and tetrameric mechanisms, but they have appeared energetically less acceptable. On the other hand, the protons transfer in meta- and para - position of heterocyclic compounds by the dimeric mechanism is spatially complicated. Consequently for the meta- and para - proton transfer in heterocycles so-called the stacking mechanism is offered. According to this mechanism of a plane of molecules are located in parallel and are revolve on 180o. On the diagram the stacking mechanism of the proton transfer in 5-Cl-imidazole (1), 4-pyridone (2), 4-thinopyridine (3) and p- aminopyridine (4) are given. For construction of model of this mechanism the quantum-chemical method of DFT (Density Function Theory) is used.



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OP 15. SYNTHESIS AND PROPERTIES OF NEW 5(6)-AMINO-2-(1-ADAMANTYL)BENZIMIDAZOLE DERIVATIVES

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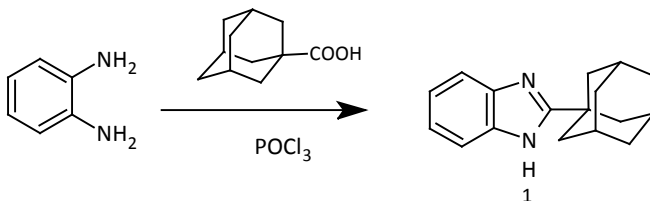
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The adamantane and benzimidazole fragment containing derivatives such as Amantadine, Amantol, Simmetrel, Mantadix, Rimantadine, Paramantine, Protexin, Viregite, Betsovet, Neoride, Bromantane, Kemantane; Parbendazole, Oxybendazole, Albendazole, Mebendazole, Flubendazole, Fenbendazole and others have a broad spectrum of biological activity [1-5]. Because of that synthesis and research of new adamantane containing benzimidazole derivatives with a purpose to make new medical preparation are perspective and actual.

The aim of our current work was synthesis of new 5(6)-amino-2-(1-adamantyl)-benzimidazole's derivatives for their following bio-screening.

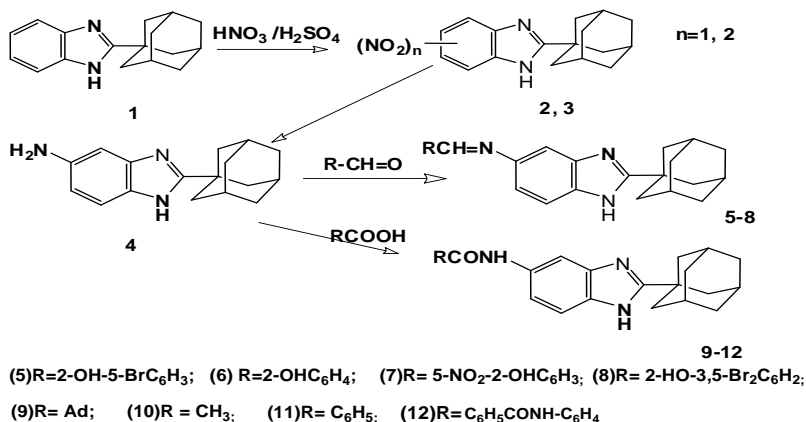
It is known [6], that *o*-phenylenediamine do not react with adamantane-1-carboxylic acid and do not give compound **1**. It was shown that *o*-phenylenediamine condensation with adamantyl-1-carboxylic acid in the presence of POCl₃ while boiling for 1 hour was obtained 2-(1-adamantyl)benzimidazole (**1**) 85% yield.



Scheme 1

2-(1-adamantyl)benzimidazole's nitration reaction was performed at room temperature by using nitration mixture of nitric and sulfuric acids and were given nitration product **2** in which catalytic reduction with molecular hydrogen in absolute alcohol in room temperature in the presence of Raney nickel were put out 5(6)-amino-2-(1-adamantyl)benzimidazole (**4**). Condensation for amino derivatives **4** with aromatic aldehydes were carried out in absolute alcohols and were given corresponding Schiff's Bases **5-8** in 70-80% yield. The reaction between compound **4** with carboxylic acid chloride in absolute ether or in toluene in the presence of

TEA or of 10% NaOH according to the reaction of Schotten-Baumann were put out corresponding amide **9-12**, 55-75% yield.



Scheme 2

The structure of the products was confirmed by IR, UV, ¹H and ¹³C NMR data.

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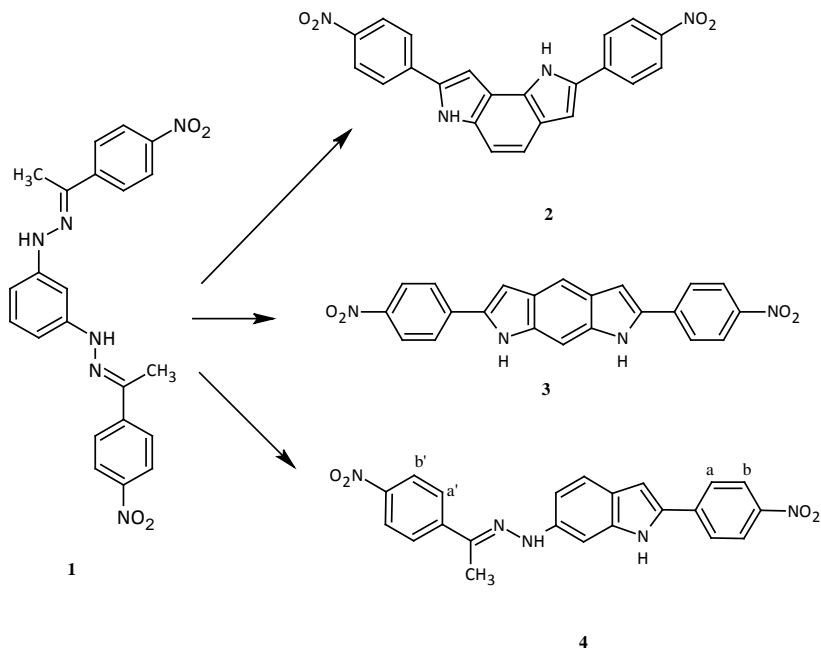
Acknowledgment: The designated project has been fulfilled by financial support of the Shota Rustaveli National Science Foundation (*Grant #GNSF/ST08/4-413*). We also want to thank the Deutsche Akademische Austauschdienst (DAAD) for supporting the partnership and the exchange program between the Ivane Javakhishvili Tbilisi State University and the Saarland University.

OP 16. ABOUT SOME STAGES OF THE MECHANISM OF E.FISHER'S REACTION

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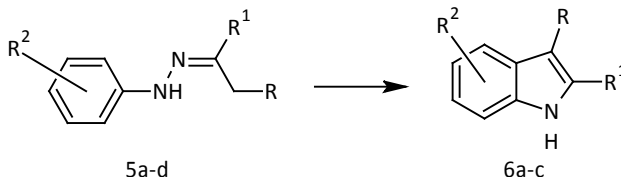
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When boiling of the solution of m-phenylhydrazone of p-nitroacetophenone (1) in the mixture of ethanol-conc. sulfuric acid, except of pirroloindoles 2 and 3, the product of monocyclization (4) is formed. In obtained mixture no other indolic compound exist. In other condensing agents (polyphosphorous acid - PPA - among them) this hydrazone doesn't change to 140 °C. After further heating resinification takes place.



Phenylhydrazone of ethyl ester of pyrrolic acid (5α $R^2=H$; $R^1=COOEt$) in PPA and its esters are indolized at 70-80 °C, analogous m-phenylhydrazone at 80-85 °C and corresponding products of bicyclization are formed [1]. Phenylhydrazone of p-nitroacetophenone (5b $R^2=H$; $R^1=C_6H_4-NO_2-p$) in PPA undergoes cyclization at 80 °C, during 30-35 min., with the yield not more than 70 %, and at 30 °C (1,5-2

hour) – with quantitative yield of analytically pure product (6 b R= R²=H; R¹=C₆H₄-NO₂-p). Almost similarly goes reaction of Fenilgidrazone of p-aminoatsetofenone (5c R= R²=H; R¹=C₆H₄-NH₂-p) [2], which amino-group undergoes protonization in PPA.



5a,6a R= R²=H, R¹=COOEt; 5b,6b R= R²=H, R¹=C₆H₄-NO₂-p;

5c,6c R= R²=H, R¹=C₆H₄-NH₂-p; 5d R=H, R²=NO₂, R¹=C₆H₄-NO₂-p;

p-Nitrophenylhydrazone of p-nitroacetophenone (5d R= R²=H; R¹=C₆H₄-NO₂, R²=4-NO₂) does not undergo cyclization reaction under considered conditions, not at ultrasound activation and does not change up to 160-180 °C, then undergoes resinification. The properties of this hydrazone are described in [3].

It is universally recognized that acceptor substituent of hydrazine fragment prevent to indolization. The influence of the R and R¹ substituents are less investigated. On the basis of literature data it is close that these substituents (except steric hindrance) promote indolization –more than others- acceptor from R side [2].

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OP 17. RESEARCH IN THE FIELD OF ADAMANTANE CHEMISTRY

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The main direction of scientific research in our group was organic and elementorganic synthesis for a specified purpose to create of wide spectrum bioactive compounds and prophylactic and therapeutic medications.

Goals and Objectives of Research:

1. Development of chemical synthesis schemes for analogues of high effective preparations; their modification by an adamantane structure.
 2. Study of synthesis, chemical and spectral properties of new derivatives of the adamantane line.
 3. Study and evaluation of interrelation between the chemical structure and biological activities of the compounds.
 4. Study of synthesized compounds for their different bioactivities.
- Chemical schemes and methods for synthesis of analogues high effective preparations of Rafoxanide and Trinoine - GZ-048, GZ-051 are developed.
 - Modification of the preparations GZ-048, GZ-051, Fenacetine and others by an adamantane structure are performed on the basis of amines and carboxylic acids of the adamantane line.
 - Hydroxyacetylenes, their corresponding saturated derivatives, and silicium containing acetylene alcohols of adamantane line are synthesized. Hydrosilation reactions for unsaturated compounds are studied.
 - Adamantane containing amines, amides, Schiff's bases, hydrazides, alcohols, phenols, ketones, carboxylic acids, amino acids are synthesized.
 - Synthesis of adamantane containing heterocyclic derivatives are performed such as indoles, benzoxazoles, oxadiazoles, tetrahydrofuranes and others.
 - Structures of the products were confirmed by IR, UV, ^1H , ^{13}C NMR and Mass spectra data.
 - Study of obtained compounds is carried out for their bioactivity. Compounds are revealed with anthelmintic, antimicrobial, antiviral, HIV inhibitors, anticancer, citotoxic and other properties.

In the verbal report, test data for bioactivity, generalization data on conducting researches, also literature data on bioactivity of adamantane derivatives and their prospective use will be presented [1-17].

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Acknowledgment: The designated project has been fulfilled by financial support of the Shota Rustaveli National Science Foundation (Grant #GNSF/ST08/4-413). We also want to thank the Deutsche Akademische Austauschdienst (DAAD) for supporting the partnership and the exchange program between the Ivane Javakhishvili Tbilisi State University and the Saarland University.

OP 18. BIOAVAILABILITY OF SOME BIOLOGICALLY ACTIVE COMPOUNDS FROM GEORGIAN FLORA

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P-glycoprotein (P-gp, 170 kDa plasma membrane protein), the most important efflux transporter in controlling the disposition of orally administrated drugs, is known to be present at high levels in the villus tip of enterocytes in the gastrointestinal tract [1]. The intestinal transport of anti-arrhythmic sum of alkaloids (Vingerbine) [2], isolated from *Vinca herbaceae* Waldst et Kit in the Laboratory of Alkaloids and hypo-azotemic flavonoid glycoside (kaempferol trioside - Flaronin) [3], obtained from *Astragalus falcatus* Lem in the Laboratory of Phenolic Compounds, were investigated first time in vitro experiments, using cells (Caco-2, MCF 7/S, MCF 7/ADR) as a model system for intestinal absorption. The overexpression of P-gp in cells was detected by Western Blot Analysis; protein content was determined using BCA Protein Assay Kit; the absorption profile of substances was investigated in the presence and absence of specific P-gp inhibitor (Verapamil). The tested compounds were measured by reversed-phase high performance liquid chromatography (HPLC) and liquid chromatography-tandem mass spectrometric (LC/MS/MS) methods [4].

In experiments Vingerbine and Flaronin demonstrated typical P-gp involved transport properties. Vingerbine constituent alkaloids (four indoline alkaloids) showed dissimilar profile of absorption, namely for alkaloids possessing at secondary amino group (H, CH₃) and C-2 (OH) positions different substituents were observed polarized transport, suggesting the existence of efflux mechanisms. In the presence of Verapamil significantly were increased the absorbed amount of both compounds (alkaloids, kaempferol trioside) in cells. These findings indicate, that active substances of Vingerbine and Flaronin are substrates and reversing agent for P-gp; and their P-gp-mediated efflux into the gut lumen may contribute to the low oral bioavailability. The increase of intestinal absorption of these compounds can be achieved through the overcoming of P-gp by including in drug formulations P-gp inhibitors or developing particulate (micro-, nano- particulate) drug delivery systems.

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OP 19. SYNTHESIS OF β -DIKETONE DERIVATIVES OF 1,3,5-TRIAZINE

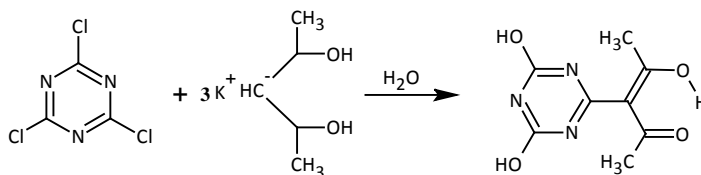
K. T. Mahmudov^{1,2}, A. M. Maharramov¹, R. A. Aliyeva¹,
F. M. Chyragov¹, M. N. Kopylovich², A. J. L. Pombeiro²

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The derivatives of 1,3,5-triazine are an important class of organic compounds with a wide variety of applications [1]. Typically the synthesized up to now 1,3,5-triazine derivatives contain aromatic substituents at 2-, 4- and 6-positions of the 1,3,5-triazine ring. The availability of the more complex derivatives is, however, rather limited due to the harsh reaction conditions necessary for the substitution at the potentially most versatile substrate, cyanuric chloride (Scheme 1). In the known procedures, C-substituted 1,3,5-triazine derivatives are usually prepared from cyanuric chloride by Friedel-Crafts reaction with AlCl_3 as catalyst [2a], or *via* Grignard reagents (ArMgX) [2b]. It is already well known [1] that the accumulation of electron donating substituents gradually decreases the reactivity of the triazine ring. Therefore, every subsequent substitution proceeds less readily than the preceding one. Thus, the exhaustive substitution usually proceeds under harsh reaction conditions excluding the application of reagents with labile functional groups or unstable fragments.

It is known [3] that methylene active compounds give carboanions in alkali medium, while cyanuric chloride can easily react with nucleophilic reagents. Thus, reacting the above-mentioned ingredients can lead to a new C-C coupling reaction (Scheme).



1

Scheme. Synthesis of β -diketone derivatives of 1,3,5-triazine.

Compound 1 was synthesized and fully characterized by elemental analysis, IR, ^1H and ^{13}C NMR spectroscopies and ESI-MS.

Acknowledgements. This work has been partially supported by the Foundation for Science and Technology (FCT), Portugal, and its strategy Programme PEsT-OE/QUI/UI0100/2001 program, as well as the Baku State University, Azerbaijan. K.T.M. and M.N.K. express gratitude to the FCT for a post-doc fellowship and a working contract.

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**OP 20. NOVEL 20-MEMBERED POLYAZOMETHINES – A POTENTIAL
TARGET COMPOUND FOR NANOTUBES**

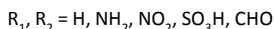
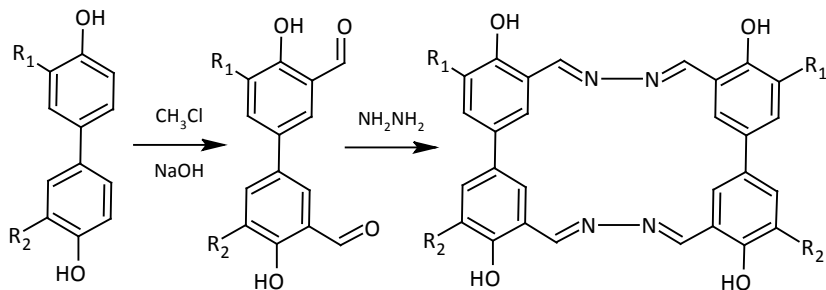
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Molecular nanotechnology is an important branch of the nanosciences that encompasses most of the existing aspects of nanomaterials, nanobiology and nanoelectronics and exhibits strong chemical appeal. With the rise of molecular nanotechnology, molecular materials are becoming a major focus of interest for the design of nanostructures and devices [1-7]. With the future of the technology unquestionably relying on the progress of the new nanomaterials science, design of organic structures able to organize themselves in a predicted manner to form nanotubular structures is an area of a current active interest.

Macrocycles are important structural elements employed in formation of nanotubular assemblies. Pioneered by Lehn use of nitrogen-containing compounds in formation of nanotubes allows for expansion of the substrate scope in pursuit of hydrogen bond-based macromolecular assemblies. Hence, we envisioned that macrocyclic azomethines, bearing properties of both azomethines and macrocyclic compounds will be highly interesting and beneficial for the field development.

We have recently developed and reported an easy and inexpensive method for construction of 20-membered cyclic polyazomethine compounds and their metal complexes as building blocks for dyes, markers, nanotubes, etc [8]. The obtained substrates exhibit good/excellent physical, chemical and technical (fastness against physical, chemical and biological treatment) and spectral (absorption near-UV region, emission in the visible region, blue-violet luminescence in the solid state, low excitation energy, etc.) properties.



Interesting data were obtained from quantum-chemical calculations of these macrocyclic compounds. Optimized models of structures are rather "thin" molecules. The thickness of molecules does not exceed 3.56Å. Hydrogen of the CH=N groups is oriented out of cycle hole. The macrocycle hole diameter is up to 4.2-4.33Å.

Charge distribution among the cycle forming atoms vary from -0.138 to +0.138. The irregularity of charge distribution provides to generate dipole moment with the value of about 3.352D. Vector of dipole moment is positioned in the "crown" center and directed at right angle to plane of molecule.

We suggest that such structure will allow arranging molecules in stable nanotubes, which is currently under investigation.

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OP 21. STEROIDAL GLYCOSIDES FROM THE SEEDS OF *digitalis ciliata* trautv.

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For decades cardenolides from foxglove occupy the leading place among the cardiac glycosides. Abundantly flowering and fructiferous *Digitalis ciliata* Trautv. is a strictly endemic plant for the Caucasus and is widespread in the Main Caucasian Ridge and its spurs. *D. ciliata* appeared to be high-grade medical raw material, in which almost all cardenolides described in *Digitalis* genus are biosynthesized. 24 cardenolides were isolated and characterized from the leaves. Medicines from *D. ciliata* – Digicilen (ampoules) and Digicil (tablets) were used extensively in medicine for the treatment of heart failure [1-3].

Ten individual steroidal compounds, among them 3 gitoxigenin cardenolides: Stospeside, Digitalinum verum and Glucogitoroside; 3 steroidal saponins, including two spirostanols – Digitonin and Desglucodigitonin and one new neogitogenin furostanole bioside: 3-O- β -D-glucopyranosyl (1 \rightarrow 4)-O- β -D-galactopyranosyl (25S), 22-methoxy- 5 α -spirostan-3 β , 2 α , 26 -triol 26-O- β -D glucopyranoside, were isolated from the methanolic extract of the seeds using column and high performance liquid chromatography,.

Four pregnane glycosides of diginigenin and 4- β diginigenin were also isolated, and one of them – diginigenin trioside – appeared a new compound with following structure: pregn-(5,6)-en-11,15-dion-3 β -12 α -dioxo-3-O- β -D glucopyranosyl (1 \rightarrow 4)-O- β -D glucopyranosyl (1 \rightarrow 4)-O- β -D-diginopyranoside.

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OP 22. THE SECONDARY METABOLITES OF ASTRAGALUS GENUS AND PERSPECTIVE OF USAGE IN THE MEDICINE

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The forty years scientific research of Astragalus species from Georgian flora were showed many-sided heal try properties. About two hundreds biologically active compounds were isolated from the different variety. They mainly present flavonoid glycosides, phenols, lignans and cycloartans. Individual components and purified sums with the considerable outlet from the raw materials exhibit hypoazotemic, diuretic, hypoglicaemic, antioxidant, anti-inflammatory (derivatives of kaempferol and isoremetine), hypocholesterinemic, immunomodulating, haemopoietic and cardiovascular (cycloartans and flavonoids) activities [1, 2].

They were recommended for the creation of medicines. The methods of receiving of perspective pharmacological preparations were elaborated.

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**OP 23. ELECTROPHILIC CLEAVAGE OF 3,6A-EPOXYISOINDOLES.
SYNTHESIS OF ISOMERIC HEXAHYDRO-1H-ISOINDOLE-
5,6-DIYL DIACETATES**

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A.V. Gurbanov³, A. M. Maharramov³**

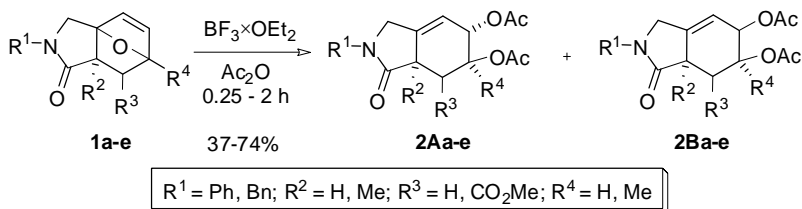
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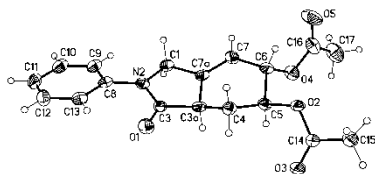
7-Oxabicyclo[2.2.1]heptenes, products of interaction of furan with electron-deficient alkenes, are the useful and largely used synthons for organic synthesis. Among the various chemical transformations of oxabicycloheptene's fragment, the nucleophilic and electrophilic oxygen bridge cleavage is of particular important, because it opens wide possibilities for the obtaining of synthetic sugar-like structures [1-3].

In this work we have studied the stereochemistry of electrophilic disclosing of the oxygen bridge in the oxabicycloheptene moiety of *exo*-oxoepoxyisoindoles **1a-e**, which can be easily obtained with the high yield by the known method [4].

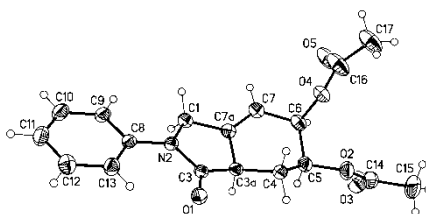


The interaction of isoindolones **1a-e** with boron trifluoride etherate in medium of acetic anhydride at room temperature for 15 min - 2 h is accompanied by the disclosure of the oxygen bridge following the formation of two isomeric partially hydrogenated isoindolones **2A** and **2B**. Interestingly, the increasing reaction time up to 1-2 days leads to the elimination of two molecules of acetic acid and complete aromatization of cyclohexane fragment of isoindoles **2**.

Isomers **A** are strongly prevail in the reaction mixture. Depending on the substituents, the ratio of **2A/2B** varies in the range of 100/0 ÷ 75/25. Individual isomers **2A** and **2B** have been separated by fractional recrystallization. The disposition of the acetoxy groups in the lactones **2** has been determined by X-ray structure analysis of the diastereomeric pair **2Aa/2Ba** ($\text{R}^1 = \text{Ph}$, $\text{R}^2 = \text{R}^3 = \text{R}^4 = \text{H}$) as well as on the basis of earlier published data on the disclosure of similar systems [2, 3, 5].



2A



2B

The authors are grateful to the Russian Foundation for Basic Research for the financial support of this work (grant No. 10-03-00177a).

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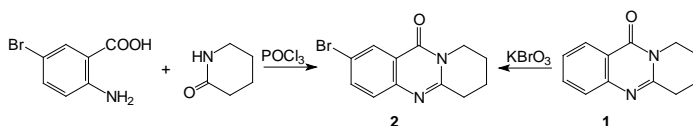
POSTER PRESENTATIONS

PP 1. **SYNTHESIS AND REACTION OF 6-BROMO-2,3-TETRAMETHYLEN-3,4-DIHYDROQUINAZOLIN-4-ONE WITH AROMATIC ALDEHYDES**

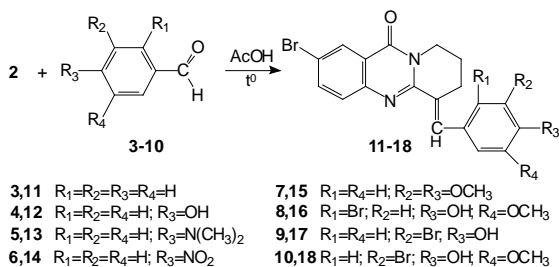
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The 6-bromo-2,3-tetramethylen-3,4-dihydroquinazolin-4-one (**2**) was synthesized by condensation of 5-bromoanthranilic acid with δ -valerolactam or reaction of 2,3-tetramethylen-3,4-dihydroquinazolin-4-one (**1**) with KBrO₃.



Earlier, we have studied the reactions of **1** and its derivatives with some aldehydes and α -arylidene derivatives have been synthesized [1,2]. Continuing of these investigations, we carry out the reaction of **2** with some substituted aromatic aldehydes (**3-10**). As a result the corresponding products **11-18** have been obtained with good yields:



The structure of the synthesized compounds is confirmed by IR-, NMR- and mass-spectral data.

References

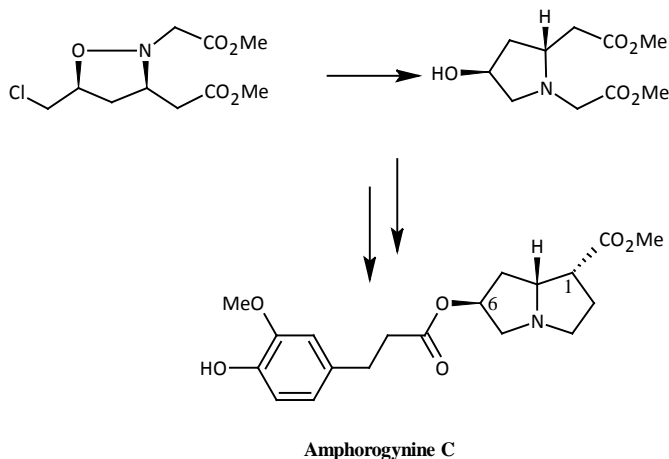
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PP 2. **STEREOSELECTIVE TOTAL SYNTHESIS OF AMPHOROGENINE C**

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Amphorogynines alkaloids represent an unusual class of pyrrolizidines, including of the azabicycles having substitution at C-1 and C-6. These alkaloids are challenging synthetic targets due to the appropriate ring opening of isoxazolidine compound leading to pyrrolidine. The key intermediate isoxazolidine could be prepared selectively by intramolecular cyclisation under mild conditions. The details of the synthetic methods will be discussed.



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PP 3. **SYNTHESIS OF SOME NEW NITROGEN-, SULPHUR- AND
PHOSPHOR ORGANIC COMPOUNDS AND THEIR BIOLOGICAL
ACTIVITY**

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Presently the search of new perspective preparations is carried out in two main directions. The first covers the comprehensive screening of numerous organic compounds. For example, such investigation is typical for USA where more than 40 thousand substances are tested every year on biological activity. Unfortunately, only two or three compounds out of them are recommended to clinical practice. After such screening a lot of perspective compounds are lost completely. In many other poor countries to carry out such screening is next to impossible. Recently, the second direction, known as the purposeful synthesis of new biologically active compounds, deserves an ever-increasing attention among scientists. This direction represents the generalization of earlier accumulated empiric correlations and their usage. Such approach gives considerable opportunity in the future to carry the synthesis out biologically active compounds more rationally.

On the ground of above approached we have synthesized a series of new nitrogen-, sulphur- and phosphororganic compounds, macroheterocyclic structures containing in their molecules bis-quaternary ammonium salts fragments, kinetin analogous and steroid hormones. The structures of these compounds were inferred on the basis of elemental analysis and IR, NMR and mass-spectra.

The biological investigation showed that some of the above synthesized compounds exhibited high biological activity. In particular some new structural analogous of melatonin clean hematoencephalic barrier and are accumulated in large amounts (400%) in the tissues of brain tumor [1,2]. Biological investigations also reveal that some compounds containing in their aromatic rings sulphonamide- and phosphororganic groups prevent the growth of the mycelium of *Vert dahliae* by 80-90 %. Others, on the contrary, stimulate the growth of alga *Chlorella Vulgaris* by 235-190 % [3]. The biological studies of other compounds are under investigation.

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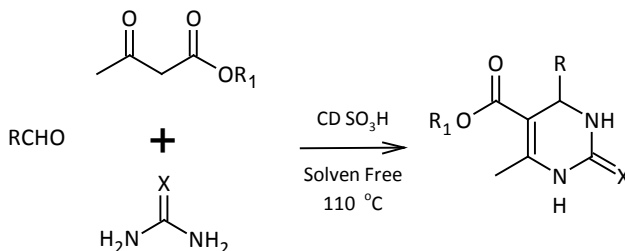
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PP 4. **PREPARATION OF β -CYCLODEXTRIN SULFONIC ACID AND ITS APPLICATION AS A SOLID ACID IN BIGINELLI THREE COMPONENTS CONDENSATION REACTION**

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Recently, interest in the synthesis of 3,4-dihydropyrimidin-2- (1H)-ones (Biginelli compounds) and their derivatives has increased tremendously because of their diverse therapeutic and pharmacological properties such as antiviral, antibacterial, antitumour and antihypertensive activities.[1] Some have been successfully used as calcium channel blockers, a -1a-antagonists and neuropeptide Y (NPY) antagonists.[2] Several alkaloids which contain the dihydropyrimidine core unit have been isolated from marine sources. Most notable among these are the batzelladine alkaloids, which were found to be potent HIV gp-120-CD4 inhibitors. [3] The Biginelli reaction is considered as an important multi-component reaction for generating compounds with diverse medicinal applications [4]. The Biginelli reaction consists in the condensation of an aldehyde, a β -ketoester and urea in the presence of an acid catalyst. However, this reaction suffers from the harsh conditions, long reaction times and frequently low yields. 3, 4-Dihydropyrimidin-2(1H)-ones are interesting compounds and play an important role in synthetic, therapeutic and bioorganic chemistry [5-7]. In recent years, new methods for preparation of dihydropyrimidinones have been the subject of research for organic chemists [4-7] we now wish to report, synthesis of novel solid acid [8], β - cyclodextrin sulfonic acid [9], and its application as efficient catalyst in three components condensation reaction of aromatic aldehyde, ethyl acetate and urea under solvent free condition.



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PP 5. **EUTECTIC SALTS PROMOTED GREEN SYNTHESIS OF PYRROLE**

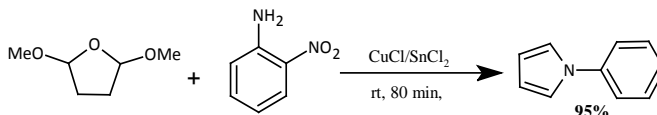
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Development of eco-friendly synthetic methodologies which are environmentally clean, waste-free, simple work up, high purity and prevent pollution have received much attention in recent years. To reach this goal, the use of green reaction media, reagents and catalysts should be investigated. By applying alternative reaction conditions, more efficient processes and new catalysts can be discovered allowing the preparation of innovative materials. Water, a unique solvent in organic synthesis, is not only abundant, inexpensive and environmentally benign, but also shows novel reactivity and selectivity for simple synthesis of organic compounds such as pharmaceutical products, agrochemicals, fine chemicals, and synthetic intermediates [1].

Substituted pyrroles are an important class of compounds displaying remarkable pharmacological properties such as antibacterial, antiviral, anti-inflammatory, anti-tumoral, and antioxidant activities. Furthermore, they are useful intermediates in the synthesis of natural products and heterocycles and are also widely used in material science. Consequently, the enormous number of procedures have been developed for the construction of pyrroles in the literature.[6] Despite these new developments, the Paal-Knorr reaction remains one of the most attractive methods for the synthesis of N-substituted pyrroles. In the Paal-Knorr approaches, diketone are converted to pyrroles by the reaction of primary amines (or ammonia) in the presence of various promoting agents.

During the course of our study aimed for improving the ecocompatibility of certain organic processes, we have been particularly interested in the development of organic transformations in a purely aqueous system to develop environmentally benign reactions. Herein, we wish to report that eutectic salts as a novel class of catalyst and reaction media for an efficient preparation of N-arylprrroles from the reaction of amines with 2,5-dimethoxytetrahydrofuran under mild reaction condition and short reaction time [2].



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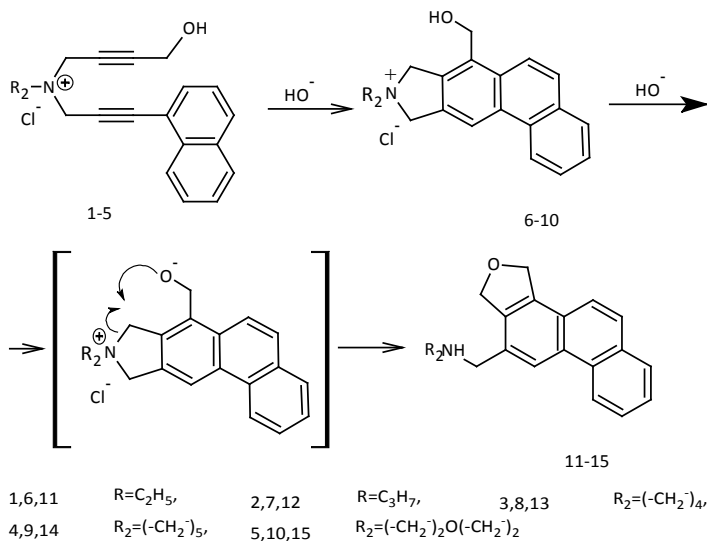
PP 6. **REVEALING OF INFLUENCE OF NUMBER OF CYCLES IN DIENIC
FRAGMENT ON INTRAMOLECULAR CYCLIZATION AND
RECYCLIZATION OF RECEIVED PRODUCTS**

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Earlier it has been established, that ammonium salts, containing groups of propargylic type alongside with various enynic fragments in presence of 0,2 mole of alkali on one mole of initial salts in a water solution at a room temperature with self-warming undergo almost quantitatively intramolecular cycization of dienic type synthesis [1,2].

It was revealed during investigations, that the cyclization of dialkyl(4-hydroxy-2-butynyl)(3- α -naphtylpropargyl)ammonium salts realizes in the presence of an equimolar quantity of alkali. Under these conditions analogous to other dialkyl-4-hydroxymethylisindolinium salts [3] occurs also intramolecular recyclization with the formation of amines of recyclization [4].



The need for more severe conditions for the cyclization of the indicated salts first of all is connected with unfavorable for the cyclization large volume of naphthyl

fragment in comparison with the phenyl. It is not excluded also the negative role of the larger electrodonor ability of the naphthyl fragment, which hampers electronic transfer by counterclockwise six-member cyclic mechanism, which was noticed also during the replacement of phenyl substituent on more electrodonor tolyl [2,4].

The toughening of the conditions of cyclization of these salts also, as well as in the case of other 4-hydroxy-2-butyryl analogues [3,5], can be explained by the presence of the hydroxyl group in the molecules of salts owing to what is created difficulty for the nucleophilic attack of diene fragment on carbon atom, which is located in the third position of dienophile, or by the decrease of alkaline concentration as a result of the formation of corresponding alcoholates, which in the aqueous solution again convert to initial state. The possibility of simultaneous influence of both noted factors is not excluded. It is established, that recyclization of salts **6-10** is realized in very soft conditions in comparison with 4-hydroxymethylisoindolinium salts [3]. The ease of recyclization of these salts is caused by smaller stability of phenanthrene cycle in comparison with the benzene and naphthalene cycles [4].

Among the analogues of salts **6-10** there are representatives with the expressed cardiovascular, hypotensive activity and analgesic action of non-narcotic nature.

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PP 7. **INVESTIGATION OF THE REACTION OF METHYLENE ACTIVE COMPOUNDS WITH EPYCHLORHYDRINES**

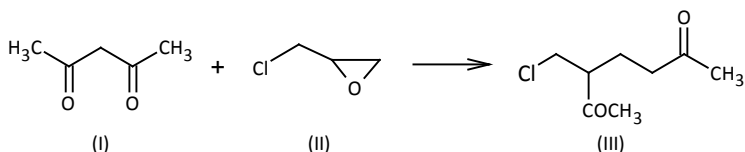
**A. M. Maharramov, F.N. Nagiyev, S.A. Gamzayeva,
M.A. Allakhverdiyev**

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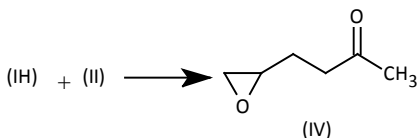
From the literary sources is known that reaction between methylene active compounds with epychlorhydrines has not been investigated thoroughly.

According to A.Khaller and Q.Blana, the reaction of acetylacetone and epychlorhydrines are produced two products: 2,5-epoxyhexene-4-ol or 1,5-epoxyhexene-4-ol-2.

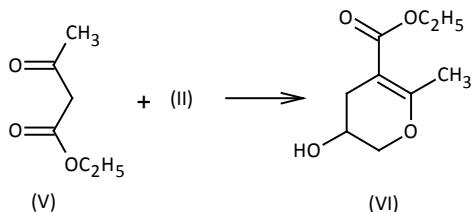
From our researches has been established that from this reaction (K_2CO_3 or DMSO) is obtained only 6-chloro-5-acetyloxyhexene-2:



The influence of change the mol ratio of reaction components to reaction yields has been determined. If ratio of components (acetylacetone, epychlorhydrine, sodium ethylate) is 1:1,5:2, in the issue the 5,6-epoxyhexanone is obtained:



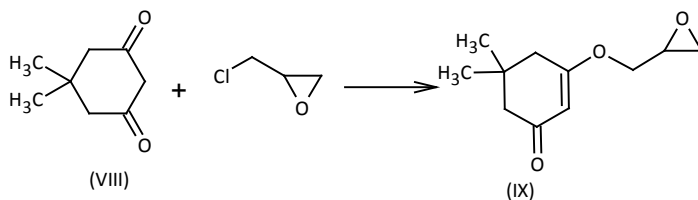
During experimentations between the ethyl ether of acetic acid (V) and epychlorhydrine in the presence of K_2CO_3 or DMSO the heterocycle of 3-hydroxy-5-ethoxycarbonyl-6-methylhydropyran (VI) is produced:



In much the same way, from the reaction of allyl ether of acetic acid (VII) with

epychlorhydrine the 3-hydroxy-5-allyloxycarbonyl-6-methyldihydropyran (VIII) is obtained.

The interaction reaction of dimedon or 5,5-dimethylcyclohexanedione-1,3 (VIII) and epychlorhydrine in the presence of K_2CO_3 or DMSO is carried out with obtaining of 3-(1',2'-epoxypropyloxy)-5,5-dimethylcyclohexene-2-ol (IX):



The structure of the synthesized compounds has been proved by IR, 1H , ^{13}C NMR and mass-spectroscopy.

PP 8. **SELECTIVE OXIDATION OF PIPERIDINE AND PYRIDINE WITH
HYDROGEN PEROXIDE**

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The wide use of pyridine and its derivatives in the synthesis of medicines, polymers, additives, pesticides, desiccants and defoliants stimulates the optimization of their syntheses.

Here, we report the selective oxidative dehydrogenation of piperidine and the oxidation pyridine coherent-synchronization of free-radical hydrogen peroxide decomposition and the oxidation of the pyridine bases.

The experiments were performed to determine the kinetics of the homogeneous oxidation piperidine and pyridine involving hydrogen peroxide. The experimental setup and procedure used in the study of conjugated oxidation with hydrogen peroxide are detailed elsewhere [1-3]. The reactions were conducted at atmospheric pressure in a flow quartz reactor of the integral type, whose design allowed undecomposed H₂O₂ to be fed into the reaction zone separately from the hydrocarbon.

We studied the dehydrogenation of piperidine, which is a fragment of many alkaloids. Our experimentals have demonstrated that the oxidative dehydrogenation of piperidine affords pyridine in a relatively high yield (65.2 wt.%) with a selectivity of at least 98% at 500-540 °C, a piperidine VHSV of 0.78 h⁻¹, an H₂O₂ concentration of 25 wt.%, and a piperidine: H₂O₂ volume ratio of 1:3 [4].

As a result of the experimental studies of the reaction of pyridine oxidation coupled (at 300-500 °C) with reaction of dissociation of hydrogen peroxide there have been established the optimum conditions (450 °C, volume rate of pyridine supplying = 0.09h⁻¹, the hydrogen peroxide concentration – 35mas.%, volume ratio pyridine: H₂O₂ = 1:3), under which there is formed the greatest quantity of 2,2-oxydipyridyl, equal 24.5% with high selectivity (90 mas%).

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PP 9. **SYNTHESIS OF POLYBROMCONTAINING SPIROBICYCLIC
ARYLAMIDES**

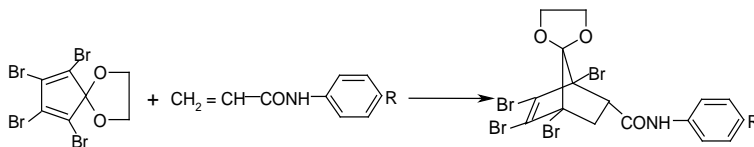
**A. M. Maharramov¹, A.M. Mustafayev², G.Kh. Veliyeva¹, S.S. Kerimova²,
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Functionally substituted polybromcontaining alicyclic compounds have biology active properties and are modifiers, plasticizers and effective fire-retardants of epoxy resins and polymer materials.

Continue our investigations in this area, presented work is interpreted the results of synthesis and investigations of new polybromcontaining spirobicyclic compounds, which synthesized by $4\pi+2\pi$ -cycloaddition reaction of 5,5-ethyldioxy-1,2,3,4-tetrabromo-1,3-cyclopentadiene (EDTBC) with N-arylsusbstituted by scheme:



$\text{R} = \text{H}, \text{CH}_3, \text{OCH}_3, \text{NO}_2, \text{Cl}$

Optimal conditions, which ensured high yields of polybromcontaining spirobicyclic compounds, have been found.

It has been shown that investigated reactions carried out stereo specifically with obtaining of endo-adducts.

The structure of the synthesized compounds has been confirmed by IR-, PMR-spectroscopy, and composition by elemental analysis.

The comparative activity of the investigated EDTBC in $4\pi+2\pi$ -cycloaddition reaction with N-arylsusbstituted acrylamides has been studied.

The kinetic study of reactivity of the investigated diene in reaction with N-aryl substituted acryl amides show, that an increasing tendency of reactivity of EDTBC is observed in reaction with N-aryl substituted acryl amides, which contained in phenyl nuclei the electron-donor and electron-acceptor substitutes.

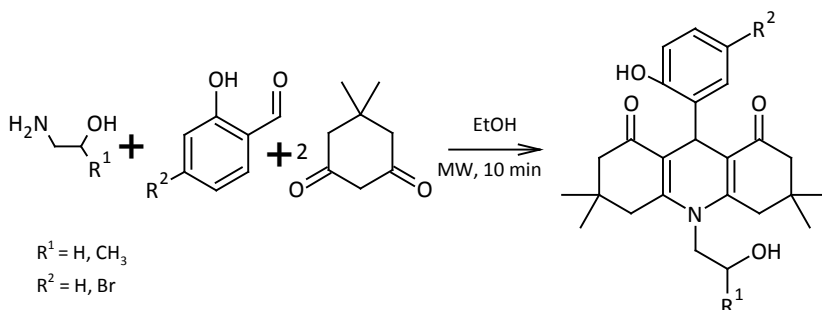
The results of experiments deduced, that investigated reaction is pertinences to the "neutral" type of cycloaddition reaction.

PP 10. **ONE-POT SYNTHESIS OF ACRIDINE DERIVATIVES ASSISTED BY MICROWAVE IRRADIATION VIA THREE-COMPONENT CONDENSATION REACTIONS**

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Acridine derivatives have been known since the 19th century where they were first used as pigments and dyes [1], acridine derivatives which made as drug used as anti-malaria[2]. Some methods are available in the literature for the synthesis of acridine compounds containing 1,4-dihydropyridines, from dimedone, aldehyde and different convenient amine via traditional heating in organic solvents or water catalyzed by TEBAC[3] and using ionic liquids[4]. We now report an efficient, no catalyst, multi-component synthesis of some substituted 7,10,11,12-tetrahydroacridindione derivatives:



Clean and simple synthesis of 3,6,6-tetramethyl-2,3,4,5,6,7,8,9,10-decahydroacridine-1,8-dione derivatives has been performed in an excellent yields via a one-pot cyclocondensation reaction of amino alcohols with dimedone in presence of aromatic aldehydes. The structure of all products has been investigated by X-ray crystal structural analyses, $^{13}\text{C-NMR}$, $^1\text{H-NMR}$, IR and Mass spectrum analyses.

References

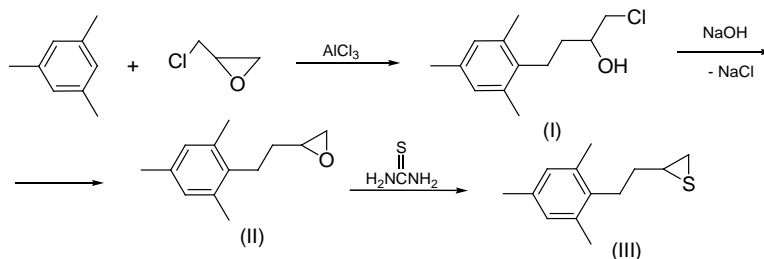
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PP 11. SYNTHESIS OF SOME HETEROCYCLES ON THE BASE OF
1,2-CHLOROHYDRINES

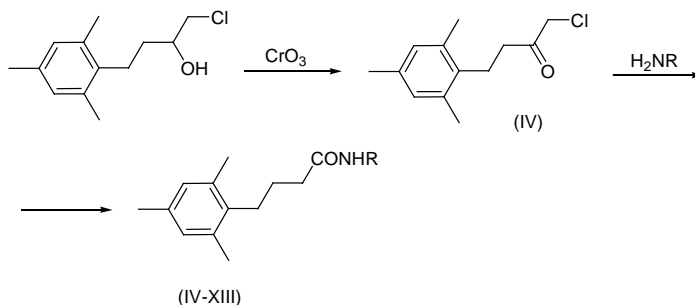
A. M. Maharramov, G.Kh. Veliyeva, R.R. Yadigarov, M.A. Akhundova, A.N. Khalilov, Y.B. Babayeva, M.A. Allakhverdiyev

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1,2-Chlorohydrines are widely used synthons in organic synthesis. On their base we obtained an oxyranes, thiiranes, α -chloroketones, aminoalcohols and other compounds, which exhibited valuable properties. For this purpose in presence of $AlCl_3$ by reaction of mesitylene with epichlorohydrine have been obtained the corresponding 1,2-chlorohydrines and held their transformations:



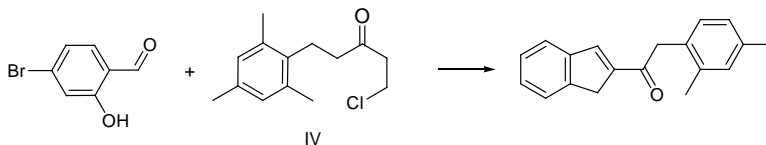
During oxidizing of 1-(2',3',6'-trimethylphenyl)-3-chloro-2-propanol (1) by CrO_3 its transformed to the corresponding α -chloroketone and have been carried out its some transformations:



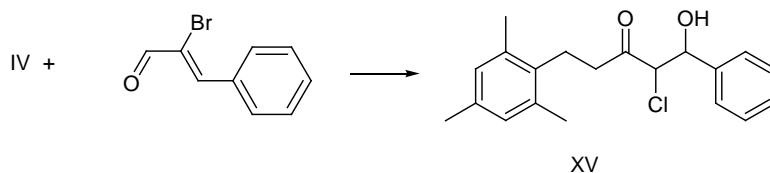
R = H, CH_3 , $(CH_3)_3C$, $(HOCH_2)_3C$, $HO(CH_2)_2$, $H_2N(CH_2)_2$, C_6H_5 , $C_6H_5CH_2$, $2-CH_3C_6H_4$

From the reaction between 5-bromosalicylic aldehyde and 1-(2',4',6'-trimethylphenyl)-3-chloro-2-propanone (IV) in the presence of K_2CO_3 in ethanol media obtained

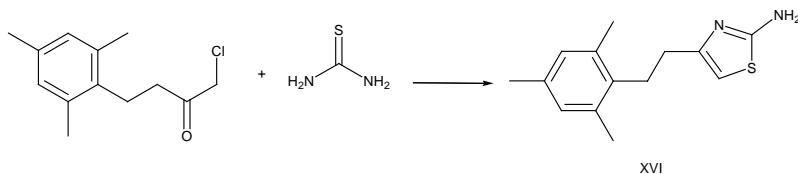
the 1-(2',4',6'-trimethylphenyl)-2-(5'-bromobenzofuranyl)-2-ethanol (XIV) with 67% yield:



The reaction of α -chloroketone (IV) with α -bromocinnamic acid in the presence of K_2CO_3 in water and ethanol media (1:4) doesn't pass in the direction of cyclization, and yields the corresponding 1,2-chlorohydrine (XV).



The interaction of α -chloroketone (IV) with thiourea in the presence of KOH produced the 2-amin-4-(2',4',6'-trimethylphenyl)thiazole (XVI):



Also the structure of synthesized thiazolamine has been confirmed by RSA.

PP 12. **SPIROCYCLIZATION OF N-ISOBUTHYLETHYLENEDIAMINE WITH
β-CYCLOHEXANOLONES**

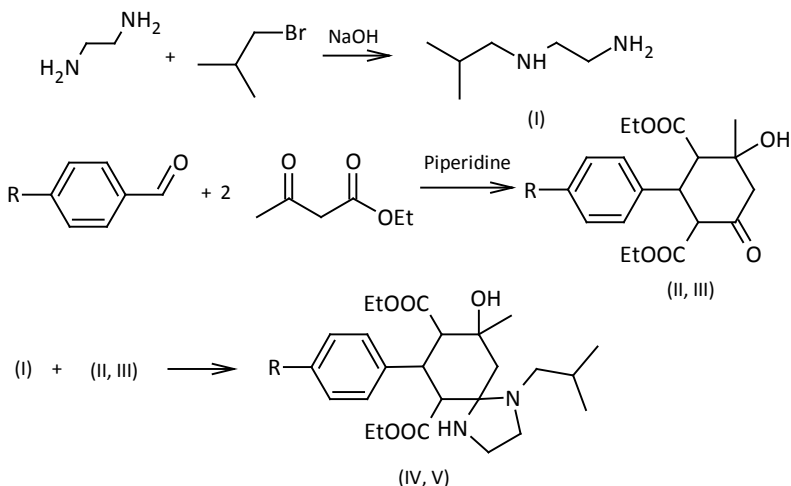
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By now chemistry of polycarbonyl substituted cyclohexanolones and particularly their reactions with nucleophylic reagents has been studied widely. Unstudied or by-way of learning are the questions of constructions on their basis spirocyclic systems and also their interactions with diamines.

We assumed that N-R-ethylenediamines have the positive synthetic perspectives in direction of spirocycles synthesis if they have been used as initial compounds in the reactions with 2-aryl-4-hydroxy-6-oxocyclohexane-1,3-dicarboxylates (β-cyclohexanolones).

In present work has been found that N-isobuthylethylenediamine (I) in soft conditions easy subjected to cyclization with β-cyclohexanolones (II,III) and brings to obtaining unknown compounds (IV,V) containing diazospirocyclic skeleton.



The structure of the synthesized compound has been confirmed by IR-, NMR- and X-ray structure analysis.

PP 13. SYNTHESIS OF 3,4-DIHYDROPYRIMIDINE-2(1H)-THIONES

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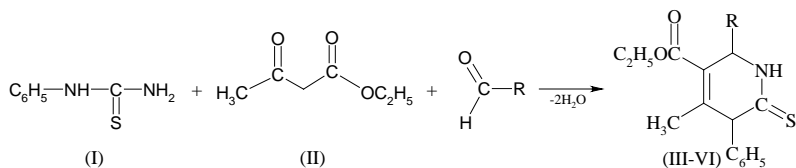
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It is well known that 3,4-dihydropyrimidine-2(1H)-thiones and their various derivatives have a wide spectrum of biology activity. Also they are the powerful calcium-channel blockers, antihypertonic drugs and antagonists of neuropeptide [1].

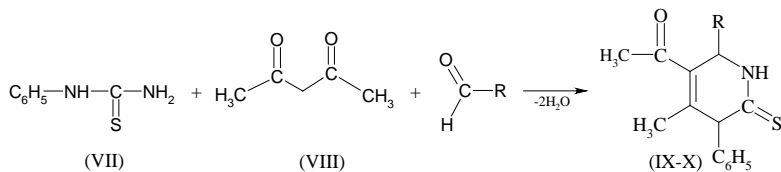
From the literary sources is known that the 3,4-dihydropyrimidine-2(1H)-thiones are obtained by Bijinelly reaction of aldehydes, methylene active compounds and thiourea in the presence of various catalysts on the one-pot three-component condensation [2].

Considering the above, 3,4-dihydropyrimidine-2(1H)-thiones in the presence of trifluoroacetic acid in ethanol media by influence of various aldehydes of acetic acid, N-phenylsubstituted thiourea the effective synthetic method has been elaborated. It has been established that in phenylthiourea participation in the three-component reaction the 5-ethoxycarbonyl-6-methyl-4-alkyl(aryl)-1-N-phenyl-3,4-dihydropyrimidine-2(1H)-thiones were obtained with 60-75% yields:



R = H, C₆H₅, 2-HOC₆H₄, 2-HO-5-Br-C₆H₃

If instead the methylene active compound take the acetylacetone the 5-acetyl-6-methyl-4-alkyl(aryl)-1-N-phenyl-3,4-dihydropyrimidine-2(1H)-thiones was synthesized:



R = H, C₆H₅, 2-HOC₆H₄, 2-HO-5-Br-C₆H₃

The synthesized 3,4-dihydropyrimidine-2(1H)-thiones have been tested as inhibitors

of cumene oxidizing. It has been established that synthesized compounds have high antioxidation properties. They are effective inhibitors of cumene oxidizing and decomposed the obtaining cumene hydroperoxide.

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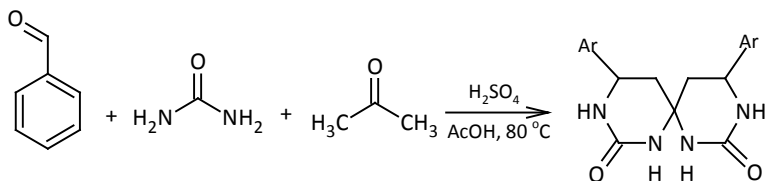
PP 14. **SYNTHESIS OF DERIVATIVES OF 4,4'-SPIROBI[HEXAHYDRO-
PYRIMIDINE]-2,2'-DIONES**

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The derivatives of pyrimidines are fragments of many biologically active and pharmacologically important compounds, including agonists and antagonists of various receptors, drugs with high antibacterial or antiviral activity [1-3]. Such variety of applications of pyrimidines' derivatives explains the appearance of modifications of classical methods of synthesis and the searching of new methods to ensure the availability of the appropriate functionally pyrimidines.

As is known, three-component condensation of various aromatic aldehydes, urea and acetophenone leads to the formation of hexahydropyrimido[4,5-d]pyrimidine-2,7-diones [4,5]. For continuing researches in this field, we set out to researches on modifying Biginelli reaction by using an aliphatic ketone-acetone. With this purpose has been carried out the three-componential condensation of certain aromatic aldehydes, urea and acetone catalyzed by sulfuric acid:



Ar = C₆H₅ (I), 2-HOC₆H₄- (II), 5-Br-2-HOC₆H₃- (III)

Ar = C₆H₅ (I), 2-HOC₆H₄- (II), 5-Br-2-HOC₆H₃- (III)

As a result of the conducted reactions have been synthesized some derivatives of 4,4'-spirobi[hexahydropyrimidine]-2,2'-diones. It has been observed that yield increased in the ratio of reagents 2:3:2:1 and was 60-70%. The reactions and the individuality of the obtained compounds were monitored by TLC on Sorbfil plates. The structure of the synthesized compounds has been confirmed by IR- and NMR-spectroscopy and also by X-ray diffraction analysis.

The data on the crystal structure of synthesized compound (I) have been deposited in the Cambridge Structural Database (CCDC 822976).

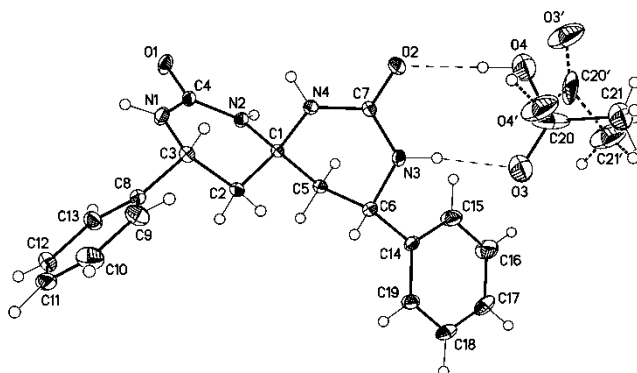


Figure. The molecular structure of compound (I)

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PP 15. **MACROCYCLIC RECEPTORS FOR PERTECHNETATE AND
PERRHENATE ANIONS**

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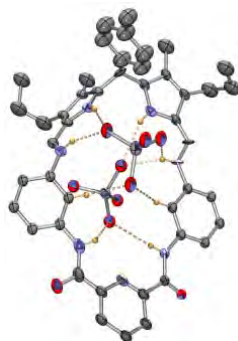
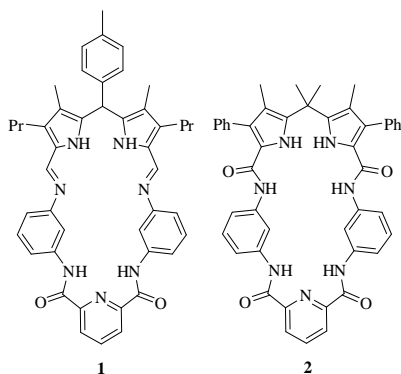
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The design and synthesis of receptors capable of selective recognition of MO_4^- ($\text{M} = \text{Re}, {}^{99}\text{Tc}$) are of great interest because they can greatly benefit the development of efficient extractants, sensors and materials for these anions as well as new approaches for labeling of organic compounds without any reduction step of Re(VII) and Tc(VII) . Neutral receptors are known to be promising in the sense of high binding selectivity for target anions.

The neutral macrocyclic dipyrromethane based hosts **1** and **2** capable of MO_4^- ($\text{M} = \text{Re}, {}^{99}\text{Tc}$) recognition were synthesized. When in protonated form, **1** binds perrhenate with strong H-bonds from pyrrole and imine NH's, weak – from amide NH's and benzene CH's according to the X-ray analysis. The H-bond network of **2** is similar to that of $[\text{1H}_2]^{2+}$, and the coordination mode of **2** with ReO_4^- was found to be equal according to the DFT studies. The non-protonated form of **1** binds to ReO_4^- using only pyrrole NH's, amide NH's and benzene CH's according to the DFT studies.



Molecular structure of **1•2HReO₄ according to the X-ray diffraction**

Affinities of the receptors towards both MO_4^- ($\text{M} = \text{Re}, {}^{99}\text{Tc}$) were acquired by direct

UV-vis titrations and towards $^{99}\text{TcO}_4^-$ specifically by reverse ^{99}Tc NMR titration. Binding constants were found to be one of the largest known to date ($K_{\text{MO4}} \approx 10^3$ - 10^5 M^{-1}). The receptors possess high selectivity towards target anions.

Structural and binding data collected are an important impact to understand perrhenate and pertechnetate interaction with organic hosts. At present we are working to generalize these findings by extending the studies to receptors that can bind perrhenate in water.

PP 16. **HETEROCYCLIC ANALOGUES OF TRIPHENYLMETHANE.
URACIL-5-YL AND 6-METHYLURACIL-5-YL-DIPHENYL METHANES**

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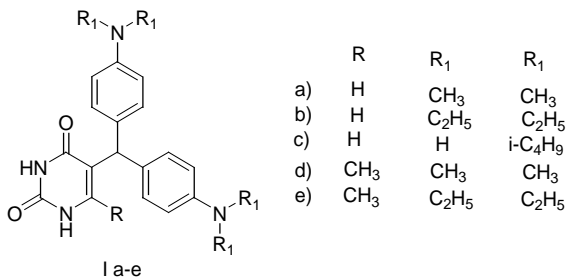
It is known, that some of the triphenylmethane dyes with substituted aniline residues poses anticancer properties on the ascite and solid mouse tumors [1,2], many of ones display cytotoxic, antibacterial, antiparasital and antiviral properties [2-4].

To present there are few samples of heteryl analogs of tryarylmethanes, comprising thienyl-2-and benzothienyl-2, indolyl-3- and unsubstituted pyridinyl-5- derivatives [5-7].

It is shown that pyrimidinyl-5-diarylmethanes inhibit estrogen synthetase enzyme (aromatase) thus exhibiting antiestrogen properties [8].

In this connection it may be expect that replacement of the one benzene ring by physiologically tolerable pyrimidines, retaining in whole tryarylmethanes motif of the molecules, leads to compounds with modified biological properties and targeting.

New uracil-5-yl- and 6-methyluracil-5-yl diarylmethanes I a-e were synthesized by heating corresponding pyrimidinyl-5-carbaldehydes with anilines in acidic media.



Compounds Ia-e in their reduced forms may be regard as prodrugs which can readily be oxidized to iminium compounds having in view increasing level of hydrogen peroxide in tumors. The structure of the new compounds were established by TLC, elemental analysis and NMR ¹H spectroscopy.

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PP 17. **FIRST EXAMPLE OF OCTAHYDROFURO[3',2':5,6]ISOINDOLO
[2,1-a]QUINAZOLINE SYNTHESIS**

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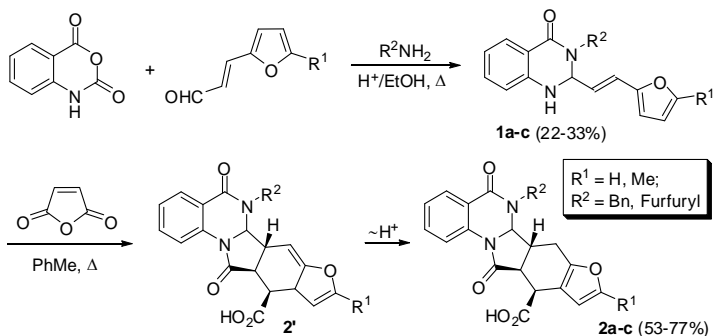
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2-Substituted quinazolines represent the important class of heterocyclic compounds, attracting attention owing to presence the wide spectrum of biological activity [1, 2].

In the present work investigated 2-furylvinylsubstituted quinazolines **1** are interesting not only because of antimicrobial activity [3], but also through several reaction centers that make these structures important as synthons for construction more complex polyheterocycles. Particularly, owing to presence the furylvinylamine fragment the intramolecular [4+2]-cycloaddition can be realized. The presence of cyclic amide groups allows carrying out the transformations by quinazoline ring.

Thermal condensation of isatoic anhydride, substituted furyl acroleins and corresponding amines [4] leads to obtaining target products 2-(2-furylvinyl)quinazolines **1a-c** with low yields.



In the present work the regio- and stereo orientation of intramolecular cycloaddition of maleic anhydride to obtained vinylquinazolines **1a-c** has been studied.

It has been shown that interaction of the initial **1a-c** compounds with maleic anhydride proceeds through the formation of the corresponding *N*-maleic amide, following [4+2]-cycloaddition of the olefinic fragment to a diene (*exo*-cyclic vinyl bond and double bond of furan ring) with the finishing rearrangement of the

intermediate **2'** into more stable aromatic system (**2**). Isoindolofuroquinazolines **2a-c** has been obtained in the form of single diastereoisomer with moderate yield [5]. The alternative products of maleic anhydride [4+2] - cycloaddition towards furan fragment of quinazolines **1** couldn't be separated.

The authors are grateful to the Russian Foundation for Basic Research (grant No. 11-03-90416) and the Ukrainian State Fund for Fundamental Researches (grant No. F40.3/045) for the financial support of this work.

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PP 18. **INFLUENCE OF DIFFERENT MACERATION TECHNIQUES AND
ENZYME PREPARATIONS ON CIS AND TRANS RESVERATROL
CONTENT IN GEORGIAN WINES**

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Resveratrol (3,4',5-trihydroxystilbene) has attracted special attention in recent decades, because of its diverse pharmacological properties. Resveratrol belongs to a class of polyphenolic compounds called stilbenes. Resveratrol is a free radical scavenger and inhibits the risk of cardiovascular diseases [1-4]. Content of polyphenols, composition of phenolic complex and antioxidative or antiradical capacity of wines could be affected by many extrinsic and intrinsic factors, such as variety, wine growing area and climatic conditions, quality of wine, and, not least, technological procedures during wine-making.

The preparations of pectic enzymes are used for a more efficient extraction of desirable red grape pigments and other phenol. Use of β -glucosidase from different sources increased the *trans*-resveratrol in some Sicilian wines by hydrolyzing resveratrol glucoside piceid.

The study was designed to determine the influence of different maceration techniques and enzyme Preparations on Resveratrol Content in wines made from Saperavi and Tavkveri Grape varieties.

Georgian Grape varieties Saperavi and Tavkveri were harvested in September 2010 Kakheti Region, Sagarejo District. Vinifications were performed in duplicate in the local winery. The mash of each grape variety was divided in 3 equal portions and sulfited with potassium metabisulfite at a rate of 120 mg/L prior to maceration. Maceration was conducted by enzyme preparations with pectolytic and cellulose activity: Lafaze He Grand Cru, producer Laffort; Panzym Clair Rapide G-Begerow; Extrazim-Institute oenologique de champagne. The pre-fermentation maceration was conducted at 8-14 °C for 15 hours.

Tavkveri wine fermentation temperature was 20-22 °C and Saperavi -25-28 °C. Saperavi grape mash was pressed after 7 days. Tavkveri grape mash was stayed for post fermentation maceration and pressed after 14 days. The racking was performed three times adding each time 30 mg/L SO₂ to prevent oxidation and spoilage. All samples were clarified before the measurements with Gelplus.

The analyses were performed in triplicate, in LTD "Wine Laboratory". The content of resveratrol was determined in the finished wine-Equipment - HPLC (Knauer);

The wines made from the same grape variety and by the same technological

process content the different amount of resveratrol. The difference caused by enzyme preparations. The results are evident on Table 1. It should be especially mentioned that the maximum level of resveratrol was obtained by enzyme preparation Extrazyme. Extrazyme along with main pectolytic and cellulase activity has the β -glucosidase side activity.

Table 1- The content of cis and trans resveratrol in the wine samples

Sample №	Grape variety	The used enzyme preparation	Cis-resveratrol	Trans-resveratrol
№1	Saperavi	Extrazyme	1.56	0.77
№3	Saperavi	Lafaze He Grand Cru	0.6	n.d
№5	Saperavi	Panzym Clair Rapide	0.49	0.17
№2	Tavkveri	Extrazyme	2.1	1.04
№4	Tavkveri	Lafaze He Grand Cru	1.8	0.7
№6	Tavkveri	Panzym Clair Rapide	1.55	0.67

One enzyme preparation extracted different amount of cis and trans resveratrol from the solid parts of Tavkveri and Saperavi grape varieties. The achieved data confirms that the resveratrol content in wine depends on grape variety.

Both grape sorts, used in this experiment, were obtained from the same location, and geographical conditions. Among varieties appreciable changes are observed in the content of cis and trans resveratrol. The level of both cis and trans resveratrol is higher in Tavkveri wine, than in Saperavi. Georgian Grape Varieties Tavkveri and Saperavi contain more cis than trans resveratrol.

Obtained results from conducted experiment confirmed that, Pre-fermentation enzyme maceration with addition of enzyme preparation Extrazyme (producer Institute Oenologique de Champagne) at 8-14 °C promotes the significant increase of resveratrol content in red wine. The different enzyme preparations extract the different quantity of *cis* and *trans* resveratrol from the same grape variety. The resveratrol content in wine depends on grape variety and wine making Technique. The prolonged time of post fermentation maceration at 20-22 °C within 14 days raise resveratrol concentration in red wine. Georgian Grape Varieties Tavkveri and Saperavi contain more *cis* than *trans* resveratrol.

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PP 19. **THE MATHEMATICAL MODELING OF THE SENSOR FUNCTIONS OF
MEDIATED CONDUCTIVE POLYMER ELECTROCHEMICAL SENSORS
OBTAINED BY ELECTROPOLYMERIZATION OF HETEROCYCLIC
COMPOUNDS**

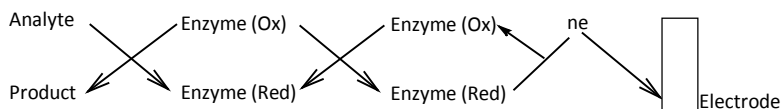
V. V. Tkach, V.V. Nechyporuk, P. I. Yagodynets', Yu. V. Meslyuk

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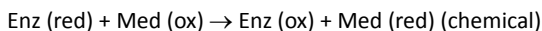
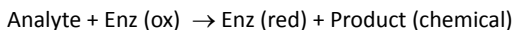
Electroanalytical chemistry being one of the most important branches of electrochemistry attracts more and more scientists. For some decades the use of conductive polymers in analytical purposes has been one of the novel approaches in it.

The sensors based on conductive polymers of 5-membered heterocyclic compounds have already gained their use in inorganic, organic (substituent- and enantioselective analysis) and pharmaceutical analysis [1-3]. In this work we describe mathematically the work in potentiostatic mode of the electrochemical sensor (or biosensor) in which the conductive polymer plays the role of mediator. This investigation may intensify the implementation of the sensor functions and avoid different instabilities. It also gives us very important information.

The scheme of the work of the typical example of this electrochemical sensor (enzymatic sensor with mediated electron transfer) can be presented as.



So, if we describe this mechanism phenomenologically, we can see that it consists of 3 stages.



So, the mathematical model of the system (with some simplifications accepted) will be described as

$$\begin{cases} \frac{dc}{dt} = \frac{2}{\delta} \left(\frac{\Delta}{\delta} (c_b - c) - r_1 \right) \\ \frac{dE}{dt} = r_1 - r_2 \\ \frac{dM}{dt} = r_2 - r_3 \end{cases}$$

In which c , E e M are the concentration of analyte in the pre-surface layer, surface concentrations of reduced forms of adsorbed enzyme and specially modified conductive heterocyclic polymer being the mediator, δ is the diffusion layer thickness, Δ is the analyte diffusion coefficient, c_b is the analyte bulk concentration, r_1 , r_2 and r_3 are the rates of the first chemical, second chemical and electrochemical stages.

The stable steady-states conditions were obtained using the Rauss-Gurwitz criterion. The oscillatory behavior in this system can be caused by the changes in DEL caused by anodic oxidation of the analyte.

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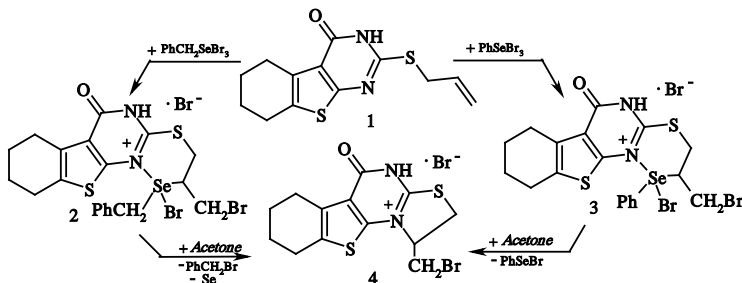
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PP 20. REACTION OF SELENIUM CONTAINING ELECTROPHILES WITH
2-ALLYLTHIOTIENO[2,3-*D*]PYRIMIDINE

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The interaction of such electrophilic reagents as phenylseleniumtribromide and benzylseleniumtribromide with 2-allylthiothieno[2,3-*d*]pyrimidine **1** had been investigated. The new selenium containing heterocycles **2** and **3** had been received as the final products. The angular structure had been proposed for condensite systems **2**, **3** on a base of IR- and ^1H NMR spectra.



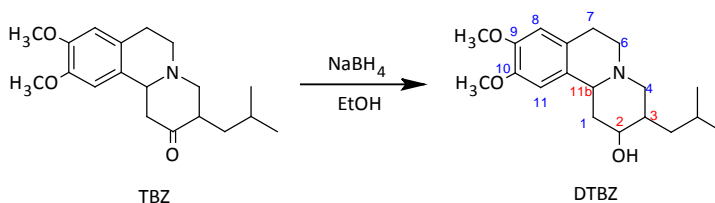
It was shown that the destruction of products **2**, **3** with preserving of cyclic structure in acetone medium leads to the formation of compounds **4**. Interestingly, the destruction of product **2** was accompanied by the elimination of elemental selenium, but in the case of compound **3**, the phenylseleniumtribromide was cleaved. The biological research for heterocycle **2** had been down. It was shown the high bactericidic and bacteriostatic activity of compound **2** to grammpozitive (*Sarcina flava*) and grammnegative microorganisms (*Klebsiella oxytoca* ATCC 13 182 and *Pseudom. Aeruginosa* ATCC 27 853).

PP 21. **SYNTHESIS AND CHARACTERIZATION OF
DIHYDROTETRABENAZINE**

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Dihydrotetrabenazine (DTBZ) has been identified as the pharmacologically active metabolite of tetrabenazine[1-2]. Tetrabenazine (TBZ) is a clinically used drug and it is relatively safe and effective treatment for a wide variety of hyperkinetic movement disorders. DTBZ is a high-affinity ligand for the vesicular monoamine transporter 2 (VMAT2) in rodents and humans brain neurons[3]. Therefore, DTBZ and its derivatives have wide application in brain imaging. Reported herein is the synthesis of DTBZ by reduction of TBZ with sodium borohydride in ethanol. Convenient operation was achieved through the slight optimization of reaction conditions described in the literature[4]. The objective product was characterized by ^1H NMR, IR, MS and X-ray diffraction. The X-ray diffraction of the single crystal indicated that the precipitated crystal contains (2R,3R,11bR) and (2S,3S,11bS) enantiomers. As the single crystal X-ray diffraction analysis of the sample only in a crystal, the result is not universal. Therefore, the analysis of DTBZ was investigated on a chiral HPLC column (Phenomenex Chirex (S)-Val and (R)-NEA; 250×4.6mm) using isocratic 95% A/5% B at 1.0 ml/min with ultraviolet (UV) detection at 280 nm with solvent A being hexane/1,2-dichloroethane (2:1) and solvent B being 0.1% trifluoroacetic acid (TFA) ethanol solution. The result of chiral HPLC showed that DTBZ obtained from our group consists of two isomers. Finally, we can infer that our DTBZ consists of (2R,3R,11bR) and (2S,3S,11bS) enantiomers.



References

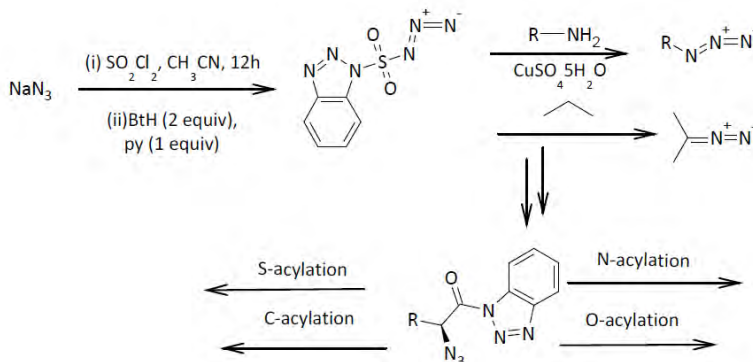
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PP 22. DEVELOPMENT OF A NOVEL REAGENT FOR DIAZOTRANSFER

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Azides can be prepared by classical nucleophilic displacement with azide anion, [1] however such reactions at the sp^3 carbon may cause inversion, epimerization, or concurrent elimination. The alternative preparation of azides from amines by diazo transfer [2] avoids epimerization, inversion, and elimination. Recently we successfully developed an ideal diazotransfer reagent: Benzotriazol-1-yl-sulfonyl azide, a new crystalline, stable, and easily available diazotransfer reagent. Utilizing this reagent we are reporting the efficient syntheses of various amides, azido protected peptides, esters, ketones and thioesters together with a wide range of azides (including α -azido acids from α -amino acids in partially aqueous conditions) and diazo compounds. In addition, the azide, as a protecting group, was examined for its functional group tolerance in *N*-, *S*-, *C*- and *O*-acylation reactions and it enables facile preparation of azido-peptides.



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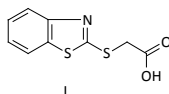
PP 23. **SYNTHESIS OF NEW POTENTIAL BIOLOGICALLY ACTIVE
ANALOGUES OF MELATONINE AND β -KARBOLINE**

N. Gongadze, L. Talakvadze

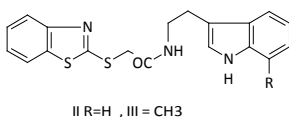
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The presented thesis deals with the synthesis of new structural analogues of important biologically active products, such as melatonin derivatives. It is widely known that the substances with aliphatic-aromatic pharmacodynamic carriers markedly change the end product's physiological activity, especially if the molecule has benzene ring [1-3].

As starting materials in our work we used benzothiazole which contains mercapto-group in position two. By the interrelation above mentioned compound with monochloroacetic acid we have described a new substance 2-(benzo[d]thiazol-2-ylthio)acetic acid (I).



We have also synthesized chloranhydride of compound (I), interrelation of the last with the biogenic amines triptamine and 7-methyltriptamine. We have obtained corresponding amides 2-(benzo[d]thiazol-2-ylthio)-N-(2-(1H-indol-3-yl)ethyl)-acetamide (II) and 2-(benzo[d]thiazol-2-ylthio)-N-(2-(7-methyl-1H-indol-3-yl)ethyl)-acetamide (III):



The structure of these compounds has been established on the basis of elementary analysis and spectroscopic investigations.

References

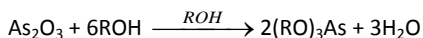
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PP 24. **OBTAINING OF SOME CYCLIC ESTERS OF ARSONOUS ACID**

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The method of obtaining the esters of arsonous acid on the basis of the wastes of arsenic production had been elaborated by us. It was ascertained that if arsenic (in the wastes) exists in oxidic form, the system can be treated by saturated monohydric alcohols – ROH, where: R=C₄H₉, iso-C₄H₉, C₅H₁₁, iso-C₅H₁₁ or C₆H₁₃, according to the method of azeotropic drying. The process is selective – among the components of the wastes only arsenic oxides or corresponding acids react with the alcohols (other compounds precipitate in the form of sludge). The reaction proceeds according to the scheme:

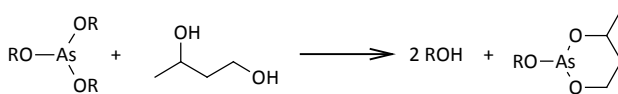


where: R=C₄H₉, iso-C₄H₉, C₅H₁₁, iso-C₅H₁₁ or C₆H₁₃.

The esters of arsonous acid of high condition can be obtained.

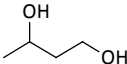
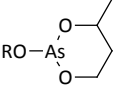
The process of interaction of butandiol-1,3 with the esters of arsonous acid was studied. We have investigated this reaction in a case of the wastes from mining-chemical production of arsenic (Racha, village Djvari, from concrete tomb).

It was ascertained that the cyclic esters of arsonous acid are formed as a result of this reaction:



The data of loading of initial compounds and the yields of the aim-products are represented in the Table.

Table 1. The data of loading of initial compounds and the yields of the aim-products

№	Initial reagents						Products		
	(RO) ₃ As								
	R	g	mole	g	ml	mole	g	mole	%
1	C ₄ H ₉	14.7	0.05	4.5	4.48	0.05	8.69	0.036	73.8
2	iso-C ₄ H ₉	29.5	0.10	9.0	8.95	0.10	17.08	0.072	74.2
3	C ₅ H ₁₁	16.8	0.05	4.5	4.48	0.05	7.76	0.031	62.1
4	iso-C ₅ H ₁₁	33.6	0.10	9.0	8.95	0.10	16.97	0.067	67.9
5	C ₆ H ₁₃	18.9	0.05	4.5	4.48	0.05	8.80	0.033	66.6

References

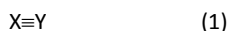
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- [2] K.M. Nacamoto. Infrared spectra of inorganic and co-ordination compounds. Moscow, "Mir", 1966, 411

PP 25. **MATHEMATICAL-CHEMICAL INVESTIGATION OF THE IONIZATION POTENTIALS OF PYRIDINE AND ITS HETERO-ANALOGUES**

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Within the scope of the block-matrices method mathematical-chemical investigation of the ionization potentials of pyridine and its hetero-analogues was carried out. The simplest model was constructed for these heterocyclic compounds:







where: $X \equiv N, P, As, Sb$; $Y \equiv C_5H_5$.

Corresponding block-matrix (B) has the form [1]:

$$\begin{pmatrix} Z_x & 3 \\ 3 & Z_y \end{pmatrix} \quad (2)$$

The values of $\lg(\Delta_B)$ and I_1 are represented below:

Compound				
$\lg(\Delta_B)$	2.37	2.71	3.06	3.25
I_1 , ev [2]	9.7	9.2	8.8	8.3

The correlation equation $I_1 \sim \lg(\Delta_B)$ was constructed on computer:

$$I_1 = -1,6 \lg(\Delta_B) + 13,5 \quad (5)$$

The correlation coefficient r is equal: $r = 0,989$. Thus, according to Japhe's criterion [3], correlation is satisfactory.

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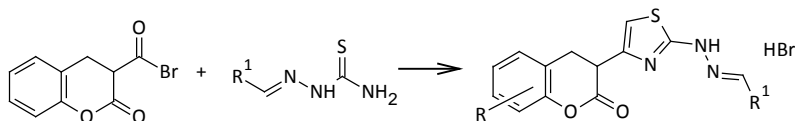
PP 26. **THE CONDENSATIONS OF 3-(ω -BROMACETYL) COUMARINS WITH AROMATIC AND HETEROCYCLIC THIOSEMICARBAZONES**

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The investigation of synthetic derivatives of 3-acylcoumarins, are mainly directed to search the compounds that possess high physiological activity. The combination of various pharmacophoric heterocyclic systems in a single molecule is one of the prospective directions of the search of new biologically active compounds.

Thiosemicarbazones are convenient reagents for cyclizations. Continuing the investigations of 3-(ω -bromacetyl)coumarins reactivity we made them react with thiosemicarbazones of benzaldehyde and its derivatives and 2-hidroxy-1-naphthaldehyde, which forms the compounds containing either coumarin or thiazole cycles.



where R = H, 8-CH₃O, 6-O₂N, 5,6-benzo;

R¹ = C₆H₅, 3-CH₃O-4-HOC₆H₃, 2,4-(CH₃O)₂C₆H₃, 2-HOC₁₀H₆,

The mentioned thiazole-containing hydrazones were also obtained by interaction between 3-(ω -bromacetyl)coumarins with thiosemicarbazide in ethanol with next addition of corresponding aldehydes. The condensation forms the preliminary hydrazine that reacts with aldehydes afterwards.

We've also found the conditions necessary to ciclize 3-(ω -bromacetyl)coumarines with thiosemicarbazones of 2-acetylbenzimidazoles and 3-acetyl-4-phenyl-6-chloro-2-quinolones, resulting of which were obtained the thiazole derivatives containing coumarin, benzimidazole and quinolone cycles.

The cyclization of thiosemicarbazones of 2-acetylbenzimidazole and 3-acetyl-4-phenyl-6-chloro-2-quinolones with monochloracetic acid and maleic anhydride leads to form the heterocyclic systems with 4-thiazolidonic fragment.

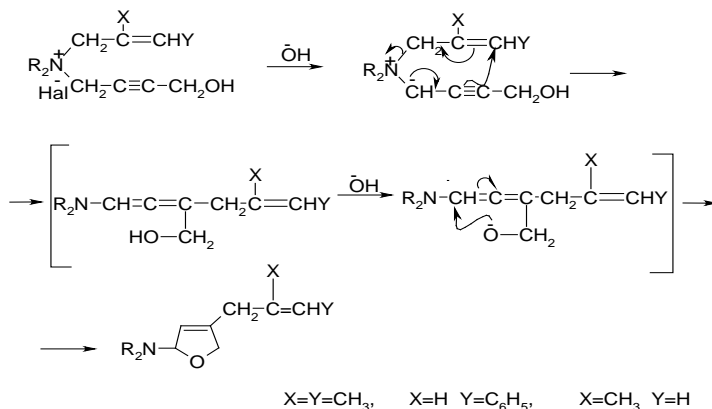
The structure and the composition of the obtained compounds were confirmed by the results of the element analysis, thin-layer chromatography and spectral data.

PP 27. **THE STUDY OF BEHAVIOR OF AMMONIUM HALIDES, CONTAINING ALLYLIC TYPE GROUPS ALONGSIDE WITH 4-HYDROXY-2-BUTYNYL GROUP, IN CONDITIONS OF WATER-BASE CLEAVAGE REACTION**

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For the first time it was established that the salts, containing allylic group along with 4-hydroxy-2-butyryl fragment, in water-base cleavage conditions mainly undergo to Stevens rearrangement, proceeding with the transfer of the reaction center and the reverse of migrating group.



In the case of allylic and metallylic analogues the ylide's attack on the α - or γ -position of the allyl unit leads to the same product. Based on the results, obtained during the study of behavior of crotyl and phenylallyl analogues of these salts in water-base cleavage conditions by IR, 1H and ^{13}C NMR methods, clearly established that the Stevens rearrangement of these salts proceeds with the transfer of the reaction center and the reverse of migrating group, leading to the formation of substituted aminoalcohols with allylic group, the intramolecular cyclization of which in result of O-alkylation leads to an aminoderivatives of dihydrofuran. The observed phenomenon is a unique case in the field of Stevens rearrangement. In result the mixture of two diastereoisomeric amines was obtained. According to data of 1H and ^{13}C NMR spectroscopy, a percentage of the diastereomeric amines in mixture is 60:40.

PP 28. TRANSFORMATION REACTIONS OF BIS-METHYLIDENE BASE OF
INDOLO[4,5-e]INDOLE

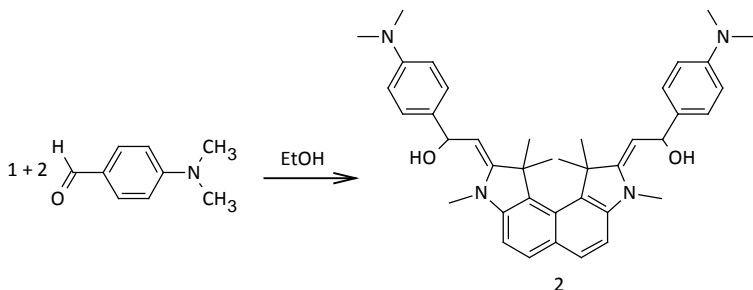
M. Trapaidze¹, N. Esakia¹, Sh. Samsoniya¹, U. Kazmaier²

¹ Ivane Javakhishvili Tbilisi State University, Georgia

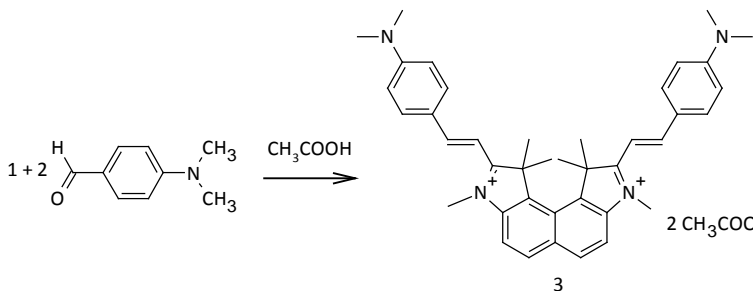
² Saarland University, Germany
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Condensation with aromatic aldehyde, Vilsmeier and azo coupling reactions are realized on the basis of a bis-methylidene base – 1,1,3,8,10,10-hexamethyl-2,9-dimethylidenindolino[4,5-e]indoline (1) [1].

Condensation reaction with p-dimethylaminobenzaldehyde was fulfilled under rather conditions. As a result of reaction in the ethyl alcohol medium 1,1,3,8,10,10-hexamethyl-2,9-di[(p-dimethylaminophenylloximethyl)methyliden]indolino[4,5-e]indoline (2) was isolated as a direct addition product in the form of the blue powder.



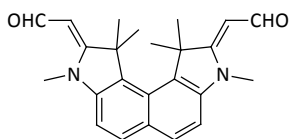
Condensation reaction in the acetic acid medium ends with isolation of corresponding salt 3 of the dehydration product after bonding in the form of lilac powder.



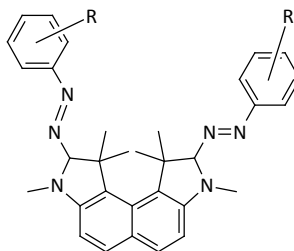
As a result of bis-methylidene base formylation under Vilsmeier reaction

conditions diformyl derivative 4 i.e. bis analog of Fischer aldehyde is obtained.

Azocoupling reactions with phenyldiazonium salts were carried out in dioxane aqueous solution. Dihydrazones formed at the first stage of reactions, without isolation, after alkali treatment were transferred in the corresponding azocouplings 5,6.



4



5,6

R = Br, SO₂-NH₂

References

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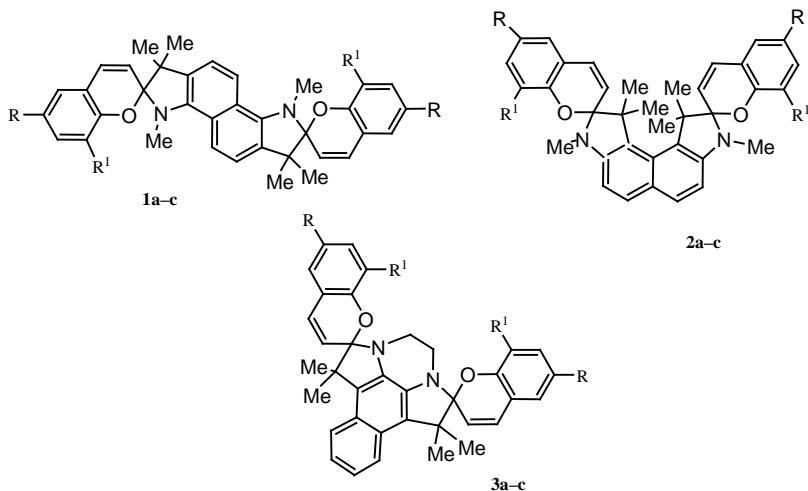
PP 29. **PHOTOCHROMIC PROPERTIES OF DIPYRROLONAPHTHALENES
BIS-SPIROCHROMENE**

**Sh. Samsoniya, M. Trapaidze, N. Nikoleishvili, K. Japaridze,
J. Maisuradze**

Ivane Javakhishvili Tbilisi State University, Georgia
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Increasing technical requirements for spiropyrans - bathochromic shift of the absorption band of the open form and increase the lifetime of colored forms – made scientists to synthesize structures containing more than one photochromic center. Unlike spiropyrans bisspiropyrans are of particular interest due to the fact that if two pyran fragments uncouple simultaneously the conjugated chain increases significantly and the maximum of the photoinduced absorption band must have a strong bathochromic shift [1].

The aim of the present work was to study photochromic properties of the already synthesized by us [2,3] new condensed indoline bisspiropyran systems 1-3.



1, 2 $R^1 = NO_2$, $R^2 = H$; **b** $R^1 = R^2 = NO_2$; **c** $R^1 = R^2 = Br$; **3 a** $R^1 = NO_2$, $R^2 = H$;
b $R^1 = Br$, $R^2 = H$; **c** $R^1 = R^2 = Br$

Photochromic properties were studied by the electronic spectra. Electronic spectra of bisspiropyran compounds 1-3 of fresh alcohol solutions were studied after they were irradiated with UV light of a mercury lamp and heated. In the electronic spectra of the irradiated solutions of compounds 1a-c were observed no changes, and in the spectra of solutions after heating the intensity of the absorption bands

increased, and in some cases bathochromic shift of the absorption bands was indicated.

Electronic spectra of compounds 2a-c of both irradiated and heated solutions showed changes in the absorption band intensities and a weak shift of the maxima. Therefore, these compounds exhibit weak photochromic properties.

Electronic spectra of compounds 3a-c appeared to be of interest. The spectra were recorded of freshly prepared solutions in chloroform, ethyl alcohol and benzene. The spectra of the compound CHCl_3 indicate significant changes after irradiation of the solutions with UV light of a mercury lamp, long-wave peak shifts were observed, and in the spectra of alcohol and benzene solutions only absorption maxima intensities were changed. In the spectra of more concentrated solutions, long-wave peaks corresponding to the betaine form were presented in the form of intense bands.

According to literary data [1,4], long-wave maxima in the bisspiropyran electronic spectra appear in the range of 500-650 nm, which correspond to the disclosure of a pyran ring in betaine forms. The data obtained of the electronic and NMR spectra confirm this assumption. However, after irradiation of highly dilute solution of compound 3b in chloroform an intense absorption band at 241 nm (1.254) was detected in the electronic spectrum and a low-intensity band in the visible region at 840 nm (0.037) was fixed. This may be caused by opening of both pyran rings.

Thus, the study of spirochromene electronic spectra showed that photochromic properties of the compounds based on benzo[e]pyrrolo[3,2-g]indole 3a-c are expressed more distinctly than those of compounds based on the isomeric indoloindoles. This, probably, is due to the easy solubility benzopyrrole derivatives, which makes their practical application prospective.

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PP 30. **CHEMICAL PROPERTIES OF DIPYRROLOBENZOQUINOXALINE BIS-METHYLIDENE BASE**

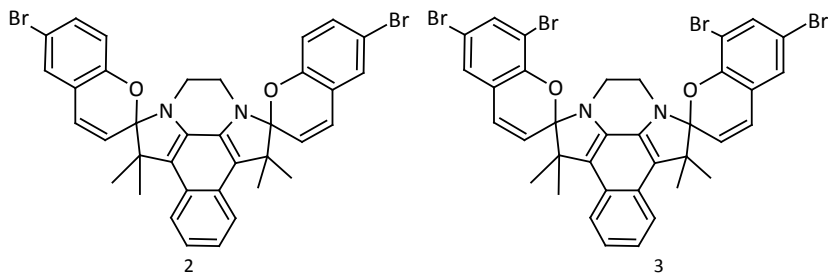
**Sh. Samsoniya¹, M. Trapaidze¹, N. Nikoleishvili¹,
N. Esakia¹, U. Kazmaier²**

¹ Ivane Javakhishvili Tbilisi State University, Georgia

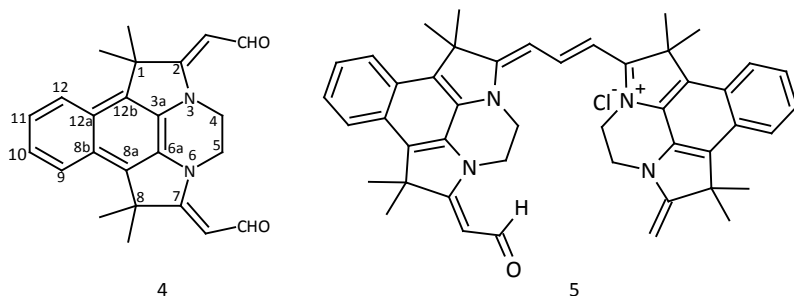
² Saarland University, Germany
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Reactivity of 1,4,5,8-tetrahydro-1,1,8,8-tetramethyl-2,7-dimethyldipyrrolo[1,2,3-d,e:3,2,1-i,j]benzo[g]quinoxaline (1) is studied in Vilsmeier and azo coupling reactions, also in condensation reactions with salicylic aldehydes.

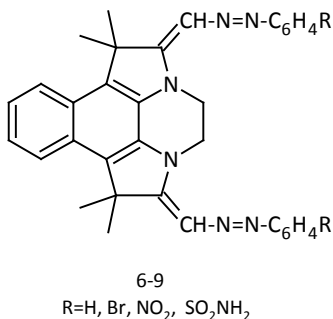
By condensation of a Fischer base 1 with 5-brom- and 3,5-dibromsalicylic aldehydes, in the medium of absolute alcohol, photochromic bis-spirochromans 2,3 [1] are synthesized whose photochromic properties are studied by electronic spectra.



While formulation of Fischer base 1 by Vilsmeier complex (with molar ratio 1:5) at 40 °C dialdehyde 4 is formed. It reacts with an initial Fischer base if reaction medium is heated to 60 °C, and a condensation product trimethine cyanine 5 is obtained.



Azo coupling reactions between the Fisher base 1 and phenyldiazonium salt were carried out by a method similar to the method used in the case of unsubstituted benzopyrroloindole [2]. Bis-diazocompounds 6-9 are synthesized.



A structure of synthesized compounds 2-9 was established by spectral methods.

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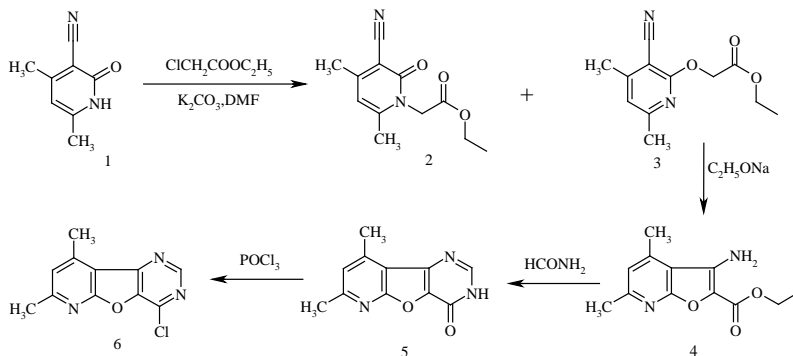
PP 31. **SYNTHESIS OF NEW CONDENSED DERIVATIVES OF
FURO[3,2-d]PYRIMIDINES**

A. A. Hovakimyan, S. N. Sirakanyan, A. S. Noravyan, N. Avetisyan

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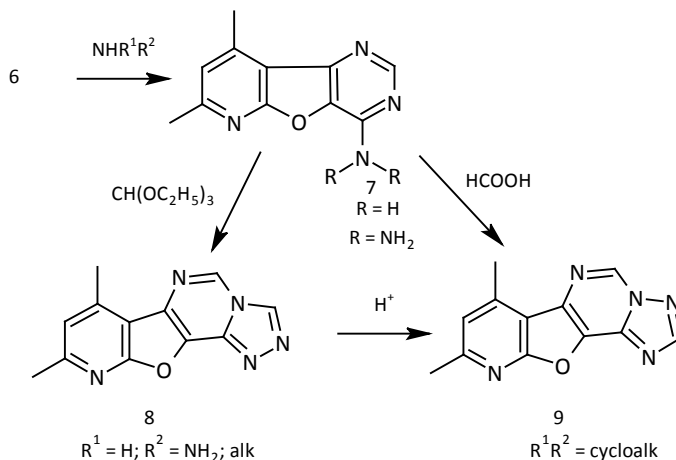
Natural and synthetic derivatives of condensed furopyridines are widely used in modern medicine [1-4].

The present work concerns the extension of our studies in this field to the synthesis of condensed derivatives of furo[3,2-d]pyrimidines. As an initial compound, we used 4,6-dimethyl-2-oxo-3-cyano-1,2-dihydro-3-pyridine **1** [5]. The latter was alkylated by chloroacetic acid ethyl ester and as a result of alkylation the mixture of N- 2 and O-alkylated **3** derivatives were obtained, which were firstly characterized by us. Cyclization of the O-alkylated derivative **3** into furo[2,3-b]pyridine occurred only in absolute ethanol in the presence of sodium ethoxide **4**. The presence of convenient functional groups in the furan ring makes possible its condensation with formamide leading to furo[3,2-d]pyrimidin-8-one **5**. Then it was converted into the corresponding 8-chloro derivative by the action of phosphorus oxychloride **6**.



In order to insert amino groups into the pyrimidine ring, we carried out reaction of **6** with various amines in butanol, which resulted to the required 8-amino derivatives **7**.

Further, to synthesize new condensed heterocycles, we used the 8-hydrazinofuro[3,2-d]pyrimidine **7**. Reaction of 8-hydrazinofuro[3,2-d]pyrimidine with orthoformic ester and formic acid led to isomeric pentacyclic compounds: triazolo[1,5-c]- **8** and triazolo[4,3-c]pyrimidines **9**.



The last compound was prepared from triazolo[1,5-c]pyrimidine by the Dimroth rearrangement under the acidic conditions.

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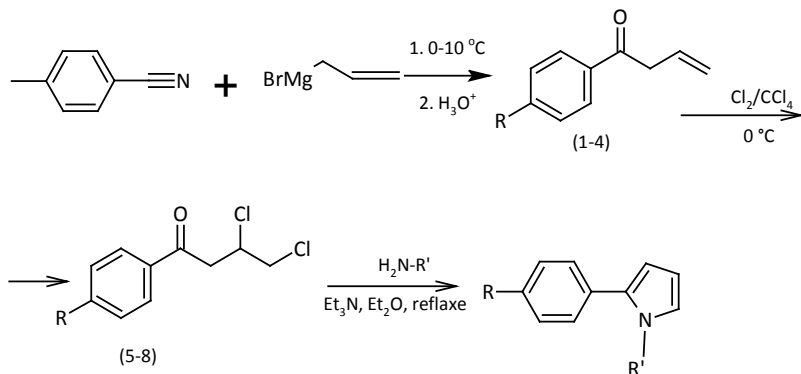
PP 32. EFFICIENT METHOD SYNTHESIS OF CANNABIMIMETIC PYRROLES

**A. M. Maharramov, I. M. Akhmedov, M. N. Maharramov,
Kh. A. Qarazadeh, N. D. Sadikhova**

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In 2006 J.W. Huffman et al. reported the synthesis CB₁ and CB₂ receptor affinities for a series of N-alkyl-2-phenyl-3-naphthoylpyrroles [1]. 2-Phenylpyrroles was prepared in poor (22%) yield from acetophenone oxime and 1,2-dichloroethane by the procedure of Korostova et al. [2] and Suzuki coupling of N-C₅H₁₁-2-bromopyrrole with four substituted arylboronic acids (p-R-phenyl; R=CH₃, CH₃O, Cl, m-Cl.phenyl) under the condition used for preparation of N-C₅H₁₁-2-Rphenylpyrroles with poor (10-26 %) yields.

Recently, we described the synthesis of N-alkyl-2-phenylpyrroles under the condition of phenyl-2,3-dichloropropylketone with alkylamines in the presence of triethylamine by reflux in diethylether for 7 h. [3]. In our work we found a new and efficient method for the synthesis of cannabimimetic pyrroles from p-R-phenyl nitriles the following scheme:



R - CH₃, CH₃O, Cl, Br; R'=alkyl, aryl.

The reaction furnished the N-alkyl(aryl)-2-R-phenylpyrroles derivatives (9-12) in 70-80% yields. All the synthesized compounds were identified by NMR spectroscopic and element analysis methods.

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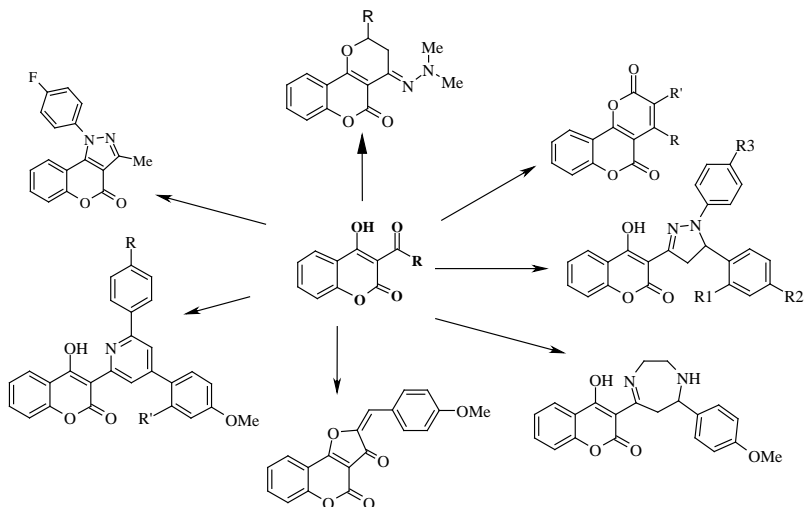
PP 33. **BORONDIFFLUORIDE COMPLEXES OF SOME
ACYL(HYDROXY)HETARENS: STRUCTURES, CHEMICAL
REACTIVITY AND BIOLOGICAL ACTIVITY**

V. F. Traven

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Many derivatives of coumarin are of much interest due to their remarkable fluorescent properties and prominent biological activity [1]. While studying chemistry of coumarin and some of its analogs we have prepared borondifluoride complexes of 3-acyl-4-hydroxycoumarins and their analogs – derivatives of 2-quinolone, dehydroacetic acid, pyrido[1,2-a]indole. We studied these complexes by X-Ray analysis as well as by NMR spectra and found significant delocalization of electron density in their dioxaboron cycles.

Borondifluoride complexes of 3-acyl-4-hydroxycoumarins and their analogs have been found to be useful intermediates for synthesis of different substituted and condensed heteroarenes [2]. Some of the studied synthetic routes are shown on the scheme below for borondifluoride complex of 3-acyl-4-hydroxycoumarin as example.



Several of the synthesized compounds have been found to behave prominent AID Integrase inhibition activity [3], photochemical sensitivity [4], and sensing ability to proteins [5].

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PP 34. **SYNTHESIS OF SOME STEROIDAL PYRAZOLINES FROM ACETATE
OF 5 α - PREGNENOLONE**

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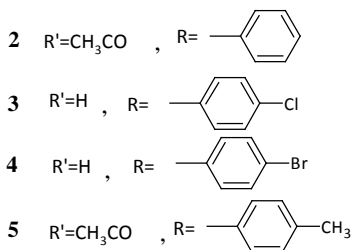
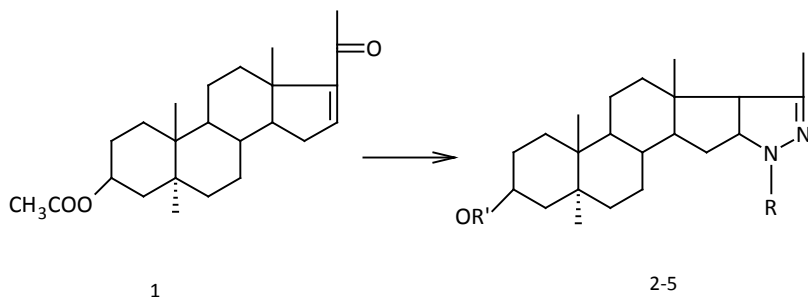
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Series of androstane and pregnane steroids - condensated with heterocycles, reveal interesting physiological activity.

Because of the great theoretical and practical importance steroidopyrazolines are widely studied. They are potentially antiandrogenic, antibacterial and anticancer agents [1-3].

During the process of revealing new biologically active 5 α - steroids, synthesized on the basis of tigogenine, we received some androstano (17, 16-d) pyrazolines-2 from 3 β - acetoxy-5 α -pregn-16-en-20-one **1**.



In order to synthesis steroidal pyrazolines 2-5 we used, as the main method, condensation of steroidal α -enone **1** with phenylhydrazine, p-chloro-, p-bromo- and p-methylphenylhydrazines by boiling them, during 3-4 hour, in the area of ethanol together with the catalistic amount of acetic acid. The product of the reaction was

consisted of two compounds, one of which was steroidal pirazoline received from the soaping acetate series of C-3 standing.

After the crystallization we have separated androstanopyrazolines 2-5, with high yield, the structures of which are confirmed by spectroscopic methods.

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PP 35. **THE MATHEMATICAL MODELING OF THE SENSOR FUNCTIONS OF
THE ELECTROCHEMICAL UNMEDIATED ENZYME-CONTAINING
SENSORS IN POTENTIOSTATIC MODE**

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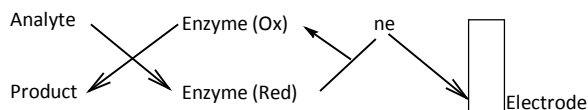
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For the last 4 decades the conductive polymers have become one of the most studied compounds, because they have been found to possess some properties that allows to use them in different purposes.

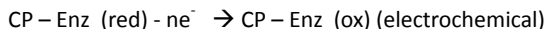
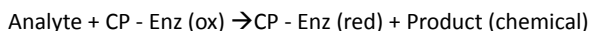
One of these properties is the possibility to modify them to use in different applications. The sensors based on conductive polymers of 5-membered heterocyclic compounds have already gained their use in inorganic, organic (substituent- and enantioselective analysis) and pharmaceutic (including enzyme-containing biosensors) analysis [1-3]. In this work we describe mathematically the work in potentiostatic mode of the electrochemical sensor (or biosensor) in which the conductive polymer molecule is modified by the functional group (or molecular fragment) capable to oxidize the analyte. This investigation may make our knowledge of the sensor mechanism more exact, intensify the implementation of the sensor functions and avoid different instabilities.

The scheme of the work of the typical example of this electrochemical sensor (enzymatic sensor with unmediated electron transfer) can be presented as.



The enzyme fragment is covalently attached to the CP molecule. We have already tried to describe the work of this sensor in galvanostatic mode

So, if we describe this mechanism phenomenologically, we can see that it consists of 3 stages.



So, the mathematical model of the system (with some simplifications accepted) will

be described as

$$\begin{cases} \frac{dc}{dt} = \frac{2}{\delta} \left(\frac{\Delta}{\delta} (c_b - c) - r_1 \right) \\ \frac{dE}{dt} = r_1 - r_2 \end{cases}$$

In which c , E e M are the concentration of analyte in the pre-surface layer, surface concentrations of reduced forms of adsorbed enzyme and specially modified conductive heterocyclic polymer being the mediator, δ is the diffusion layer thickness, Δ is the analyte diffusion coefficient, c_b is the analyte bulk concentration, r_1 , r_2 are the rates of the chemical and electrochemical stages.

The stable steady-states conditions were obtained using the steady-state requirements for two-dimensional system. The oscillatory behavior in this system can be caused by the changes in DEL caused by anodic oxidation of the analyte. The monotonic instability conditions also were found.

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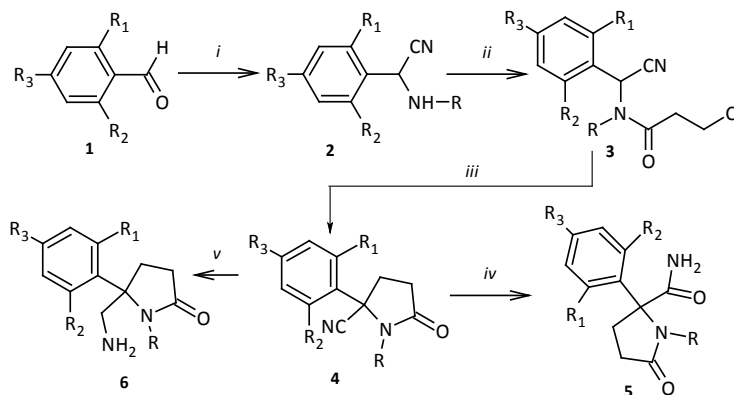
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PP 36. **SYNTHESIS OF NEW 2-ARYLPROLINES AS HIV-1 NON-NUCLEOSIDE REVERSE TRANSCRIPTASE INHIBITORS**

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In the recent years, group of compounds of non-nucleoside reverse transcriptase inhibitors (NNRTIs) of a human immunodeficiency virus (HIV-1) was open. The analysis of crystallographic data has shown that efficient reverse transcriptase inhibition activity observes for compounds with "butterfly like" structures. The "butterfly-like" conformation, i.e. geometrical shape or occupy volume, of NNRTIs is widely used criteria for searching new and more effective drugs against HIV-1 and the conformational flexibility of these molecules plays significant role in biological properties [1]. On the basis of structure and activity relationship findings, the new derivatives of 2-arylprolines which contain fragments of known reverse transcriptase inhibitor - Loviride [2] have been synthesized [3].



i (NaCN, RNH₂, H⁺, C₂H₅OH); ii (ClCH₂CH₂COCl, K₂CO₃, CHCl₃);
iii (K₂CO₃, TEBA, CH₃CN); iv (conc. H₂SO₄, rt);
v (NaBH₄, PEG - 400, CoCl₂, ClCH₂CH₂Cl).

R = Ph; CH₂Ph; 2-CH₃Ph; 4-CH₃Ph; 3,5-(CH₃)₂Ph; 2-CH₃OPh;
4-CH₃OPh.

a (R₁ = R₂ = R₃ = H); b (R₁ = R₂ = Cl, R₃ = H); c (R₁ = R₂ = H, R₃ = Br)
d (R₁ = R₂ = H, R₃ = OCH₃); e (R₁ = R₂ = H, R₃ = (CH₃)₂CHO);
f (R₁ = R₂ = H, R₃ = PhCH₂O); g (R₁ = R₃ = H, R₂ = PhCH₂O).

The synthesis of compounds of this group was carried out in 3-stage: (a) synthesis of amino nitriles (2) starting from corresponding aldehydes (1); (b) acylation of amino nitriles (2) to corresponding amides (3); (c) cycloalkylation of chloroderivatives (3) in phase transfer catalysis condition. In order to change the hydrophilicity and to synthesise compounds with various pharmacophores row of derivatives (5,6) were synthesized [4].

Compounds (4-6) have shown rather high activity against reverse transcriptase (type RT as well as K103/Y181C, Wild Type RT). The 50% inhibition concentration IC_{50} changes from 10^{-3} to 10^{-6} M. Synthesized compounds show also essential antitumor and antibacterial activity.

The X-ray structural investigation of some synthesized potential NNRTIs confirms the butterfly-like structure of investigated compounds and allows finding correlation between biological activity and certain structural parameters [5,6].

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PP 37. **SYNTHESIS AND BIOLOGICAL PROPERTIES OF 6-(1-PHENYLCYCLOPENTYL-1-CARBOXAMIDO)-PENICILLIN**

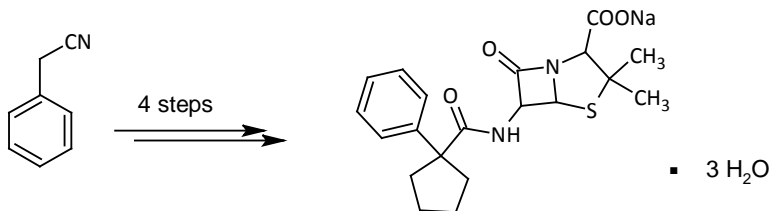
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Prior to the clinical introduction of penicillin in the 1940s bacteria were responsible for many of the world's most lethal diseases such as pneumonia, plague, gas gangrene, wound sepsis and tuberculosis, which have killed more people than any other disease. As a result of the work of Fleming and contemporaries such as Howard Florey and Ernst Chain, few people today consider bacterial infections as being as life threatening as viral infections, heart disease or tumors.

The evolution of the β -lactam antibiotics has led to the development of several distinct structural classes. Later on, not only natural but also semi-synthetic penicillins were produced by varying the structure of natural antibiotics.

Synthesis of new semi-synthetic penicillins and study of there biological activity was also carried out in our Institute. These efforts resulted both in elaboration of the method for synthesis and detection of semi-synthetic penicillins with high antibacterial activity [1]. Among them should be noted sodium salt of 6-(1-phenylcyclopentyl-1-carboxamide)-penicillin, which was synthesized by us in the form of crystalline hydrate.



Some biological properties of this semi-synthetic penicillin have been also studied and the compound was suggested as a drug in treatment of inflammatory diseases caused by various pathogenic factors that affect inflammatory reactions developing in the body [2].

Regeneration property of 5% penicillin ointment was tested on experimental burns of different degrees as well as on various skin injuries. The compound has shown a pronounced regeneration property and by its activity exceeds 5% Synthomycin ointment and does not yield to Turmanidze ointment widely used in Georgia.

The mentioned drug may be introduced into medical practice for treatment of various thermal burns as well as various injuries of skin epithelium [3].

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PP 38. **SYNTHESES AND CONVERSIONS OF 2-PHENYLPROLINE'S
DERIVATIVES**

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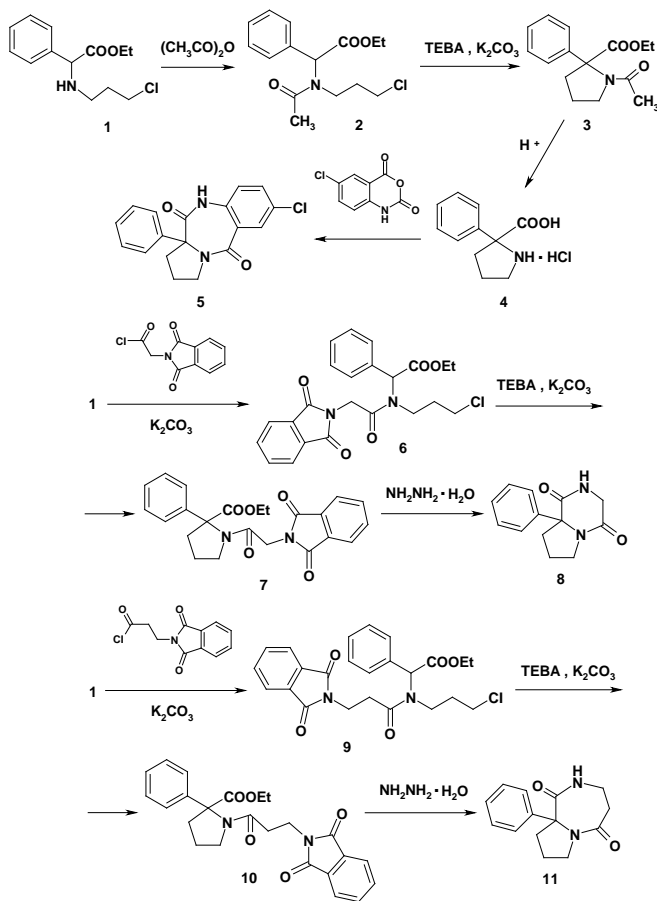
The pyrrolo[1,4]benzodiazepine (PBD) family of antitumor antibiotics such as anthramycin, sibiromycin, tomaymycin, etc. are produced by various actinomycetes. These biosynthetically derived compounds are well known for inhibiting DNA replication on account of DNA-antibiotic adduct through their C-11 carbinolamine functionality [1,2].

The goal of our investigations was the synthesis of new antibiotic compounds, in which antiviral and antitumor properties are combined. The main idea for constructing new structures lies in combination of structural fragments of known biologically active compounds. In this context the recently opened antitumor Antibiotic DC-81 from the class of PBD [3] and belong to a family of HIV-1 reverse transcriptase inhibitors offer undoubted interest [4].

The analogues of PBD antibiotics were synthesized by the method, which we were suggested previously. This method includes the synthesis of appropriate phenylglycine derivative **2** and intramolecular cyclization under phase transfer catalysis conditions [5]. Derivative **2** was synthesized by acylation of **1** with acetic anhydride, which after cyclization and hydrolysis to give the 2-phenylproline **4**. Finally by the condensation of 2-phenyl-2-pyrrolidinecarboxylic acid **4** and 5-chloroisatoic anhydride was synthesized new analog of PBD antibiotics **5** [6].

Continuing our experiments in this way, we changed acylating agent, and instead acetic anhydride 2-(1,3-dioxo-2,3-dihydro-1*H*-2-isoindolyl)ethanoyl chloride and 3-(1,3-dioxo-2,3-dihydro-1*H*-2-isoindolyl)propanoyl chloride were used. Then after intramolecular cyclization and heating with NH₂NH₂ have been synthesized pyrazine **8** and diazepine **11** respectively.

Synthesized compounds **5**, **8** and **11** are in stage of biological study.



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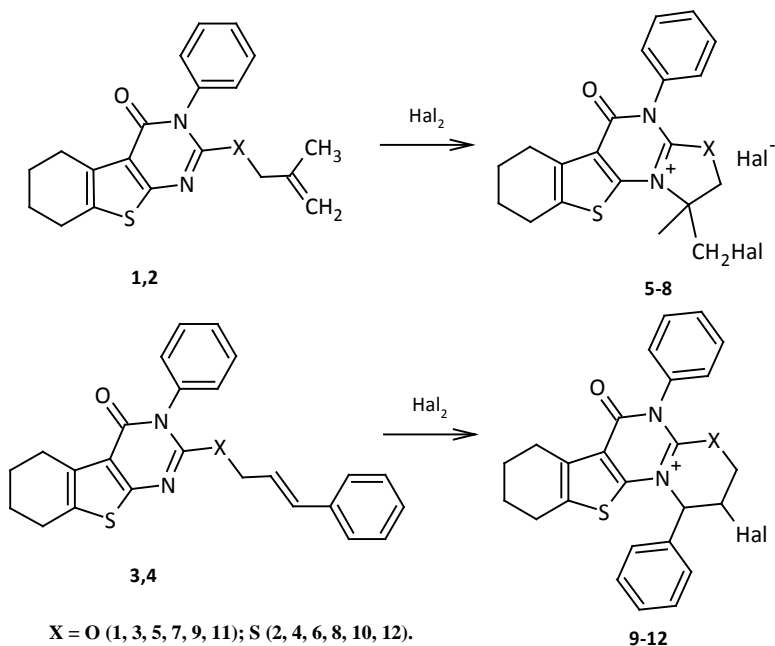
PP 39. **HALOHETEROCYCLIZATION OF ALKENYL (THIO-)ETHERS
THIENO[2,3-*D*]PYRIMIDINES**

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Fused thieno[2,3-*d*]pyrimidines continue to attract considerable attention of scientists for their great practical usefulness, especially, due to a wide spectrum of their biological activities. Early, we have reported about haloheterocyclization of allyl ether thieno[2,3-*d*]pyrimidine and investigation of chemical properties received fused thieno[2,3-*d*]pyrimidines [1, 2]. Here we wish to report results of studies on haloheterocyclization of substituted alkenyl (thio-)ethers thieno[2,3-*d*]pyrimidine, primarily, methallyl and cinnamyl (thio-)ethers (**1-4**).

It was shown, that interaction of such electrophilic reagents as bromine and iodine with 2-alkenyl(thio-)oxothieno[2,3-*d*]pyrimidine (**1-4**) in acetic acid medium leads to formation of three-cyclic condensive systems (**5-12**) of angular structure.



Interestingly, the haloheterocyclization of methallyl (thio-)ethers (**1**, **2**) leads to annelation of thiazole or oxazole five-member ring to thieno[2,3-*d*]pyrimidine system, but in the case of cinnamyl (thio-)ethers (**3**, **4**) – the formation of fused thiazino- and oxazinothieno[2,3-*d*]pyrimidines (**9-12**) had been observed. The yields of target condensation products (**5-12**) are: 62-84%. The structure and constitution of all received compounds are proved by an analysis on elements, TLC, spectra ^1H NMR, ^{13}C NMR, IR and also by chemical transformations.

It's also seen the appearance of new valuable properties (bio-screening), which expands perspective of synthesized object's complex utilization.

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thiazolo-*s*-triazoles (**4**) ($^1R = CH_3$, $^2R = H$) and *s*-triazolothiazines (**5**) ($^1R = H$, $^2R = C_6H_5$).

The yields of target condensive products (**2-5**) are: 57-92%. The structure and constitution of received compounds are proved by an analysis on elements, TLC, spectra 1H NMR, ^{13}C NMR and also by chemical transformations.

It's also seen the appearance of new valuable properties (bio-screening), which expands perspective of synthesized object's complex utilization.

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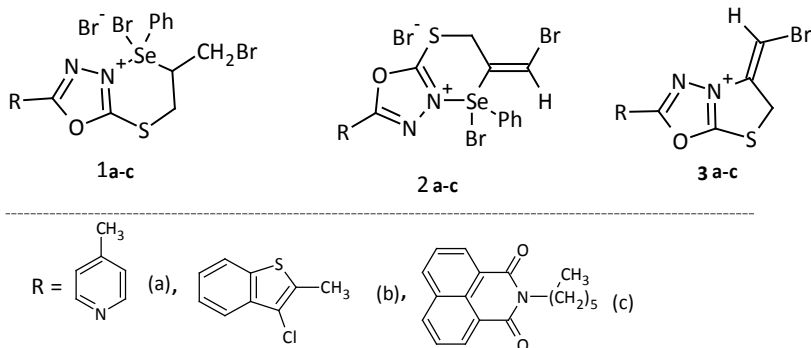
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PP 41. SELENIUM-CONTAINING HETEROCYCLES ON
A 1,3,4-OXADIAZOLE BASE

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A directed synthesis of new heterocyclic systems based on 1,3,4-oxadiazole containing selenium in their composition **1-2** has been down. These compounds were received from a reaction between phenylseleniumtribromide and 2-allyl- and 2-propargylthio-1,3,4-oxadiazole. We also found that treatment of compounds **2a** with acetone leads to a partial destruction of the selenium-containing heterocycle with the cleavage and formation of a new phenylselenenylbromide cyclic product **3a-c** which not contains Selenium.



A preliminary screening of compounds **1-3a-c** for biological activity has been down. It was found that compounds **2b**, **3b** have exhibit a high baktericidic and bakteriostatic activity to grammpositive (*Sarcina flava*) and grammnegative microorganisms (*Klebsiella oxytoca* ATCC 13 182 and *Pseudom. Aeruginosa* ATCC 27 853). Now the biological studies of these selenium heterocycles have been continied with target to utilization of these products into the practice of medicine as a disinfectant.

PP 42. **EFFECT OF pH ON N-GLYCOSYLATION OF ISOMERIC AMINO PHENOLS**

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By consideration of influence of pH on reaction of N-glycosylation it is necessary to mean that not all ampholytes are zwitterions. For example, the m-amino phenol which is typical ampholyte and is characterized by two pKa values: 4.2 and 9.9. If on the basis of results of potentiometric titration we shall calculate percentage of the ionized form of a molecule for various values of pH and pKa, it will be found out, that at pH 2.2 and below it, the amino group of m-amino phenol is completely ionized, and the hydroxyl group is not ionized; at pH 4.2 amino group is ionized on 50%. In an interval of pH 7.9 – 9.9, both functional groups are not ionized, and at pH 9.9 the hydroxyl group is ionized on 50%. At pH ≥ 11.9 the hydroxyl group is completely ionized. Proceeding from above-stated becomes clear that on an output of glycosylamines extremely important influence renders pH of the reaction medium, and for everyone of glycoside optimum value of pH can lay in rather narrow interval. Thus assume that at formation of N-glycosides with amine the acyclic form of sugar reacts.

We investigated formation of melanoidines by interaction of ortho, meta and para amino phenols with D-glucose in the acid, neutral and alkaline media (conditions of reaction: the phosphate buffer, 0.1M solutions, a molar ratio - amino acid / glucose = 1:1, temperature 100 °C, duration of reaction 2 h. $\lambda = 470$ nm). Amino phenols participating in Maillard reaction, from the point of view of dependence from pH of the reaction medium, are similar to aliphatic amino acids – with increase of pH their reaction activity increases.

In these conditions, isomeric amines obey the certain regularity. For example, at interaction of D-glucose with ortho, meta and para amino phenols in acid, neutral and alkaline media, the amount of formed melanoidine is increased with increase of pH of the reaction environment, thus, meta isomer is always least active. On ability to form the melanoidine pigment, activity of amino phenols and also their appropriate N-glucosides decreases as follows: para > ortho > meta, that is caused by values of pKa of these compounds, and also by spatial factors of the appropriate substituent groups. By interaction with aromatic amino phenols, the aldopentoses, in comparison with aldohexoses, participate during formation of melanoidines more actively.

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PP 43. **MELANOIDINE REACTION IN SYSTEM OF D-GLUCOSE / M-AMINO BENZOIC ACID AND ANTIOXIDANT ACTIVITY OF REACTION PRODUCTS**

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Reaction of melanoidine formation plays extremely important role during heat treatment of foodstuff, actually determining their aroma, taste and biological value, including their antioxidant activity. We investigated the melanoidine reaction between D-glucose and m – amino benzoic acid, and dynamics of antioxidant activity of a reaction mixture during reaction.

The mixture of D-glucose and m-amino benzoic acid (0.001 M each) in 0.005 M of the phosphate buffer pH=8, was heated up at 100 °C within 120 minutes. The reaction was monitored by high-performance liquid chromatography (Gilson, detector 116 UV, column Zorbax ODC), melanoidine products were isolated by a dialysis through a membrane from the regenerated cellulose (SPECTRA/POR®) which retains molecules with M.W. > 3500. Ability of a reaction mixture and melanoidine fractions to inhibit the peroxidation of lipids was determined in the modeling system containing an emulsion of linoleic acid, and ability to capture free radicals - with the help 1,1-diphenyl-picryl-hydrazole (DPH·). At interaction of D-glucose and the m-amino benzoic acid at first is formed N-substituted glucosylamine, and further a number of products, including high-molecular melanoidines; thus, in the first 60 minutes formation of melanoidines occurs more intensively, and further intensity of process is reduced.

Ability of a reaction mixture to inhibit the peroxidation of linoleic acid, at the first stages of reaction (10-40 minutes) gradually amplifies, and having achieved the maximal value, further insignificantly decreases; antioxidant activity of a isolated melanoidine product (M > 3500 dalton) is lower (10-15 %) than this maximal value. Ability of a reaction mixture to capture DPH·, from the beginning of reaction (10-20 minutes) quickly increases (in 20 minutes it is equivalent to quantity of 1.9 μM of Trolox in 1 ml of a reaction mixture); however, on a course of reaction, ability of a reaction mixture to capture DPH· radicals of almost disappears. Ability of an isolated melanoidine (M > 3500 dalton) to capture DPH· is rather weak. Hence, antioxidant activity of reaction mixture of D-glucose and m-amino benzoic acid arises in process of darkening of a mixture, however activity does not correlate with amount of a formed melanoidine pigment; the most active antioxidants are intermediate products of this reaction.

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PP 44. **THE CHARACTERIZATION OF REACTIVITY OF SUBSTITUTED ANILINES BY σ -CONSTANTS OF HAMMETT EQUATION IN N-GLYCOSYLATION REACTION**

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The Hammett equation describes a linear free-energy relationship relating reaction rates and equilibrium constants for many reactions involving benzoic acid derivatives with meta- and para-substituents to each other with just two parameters: a substituent constant and a reaction constant. Relative reactivity of isomeric aromatic amines in reaction of N-glycosylation it is possible to characterize on the basis of σ -constants of equation of Hammett.

Aromatic amines used in our experiments are the substituted anilines where as substituent groups act: CH₃, OH, COOH. The methyl group has positive inductive effect, but has no mesomeric effect; Group OH is characterized by weak negative inductive effect and strong positive mesomeric effect; Group COOH is characterized by negative inductive effect and negative mesomeric effect. For reaction of N-glycosylation of substituted anilines, members of Hammett equation $\lg(k/k_0) = \sigma\rho$ will have the following values: k is a N-glycosylation reaction rate constant (or an equilibrium constant) of substituted compounds (isomeric toluidines, amino phenols or amino benzoic acids); k_0 are the relevant parameters of aniline; σ is a constant of the substituent; ρ is a constant characteristic for given reaction of N-glycosylation, and being a measure of sensitivity of this reaction to the changes of the substituent. In case of isomeric toluidines, amino phenols or amino benzoic acids, this member of equation (ρ) practically changes only insignificantly (or does not vary at all), then for meta and para isomers of substituted anilines the $\lg k$ will have the following values: meta toluidine 1.16; para toluidine 0.77; meta amino phenol 0.8; para amino phenol 0.18; meta amino benzoic acid -0.43; para amino benzoic acid -0.35. The experimental data received by N-glycosylation of specified substituted anilines, correlate to values of $\lg k$ calculated with the help of Hammett equation, and also with other such parameters as values of pKa and values of dipole moment of these compounds.

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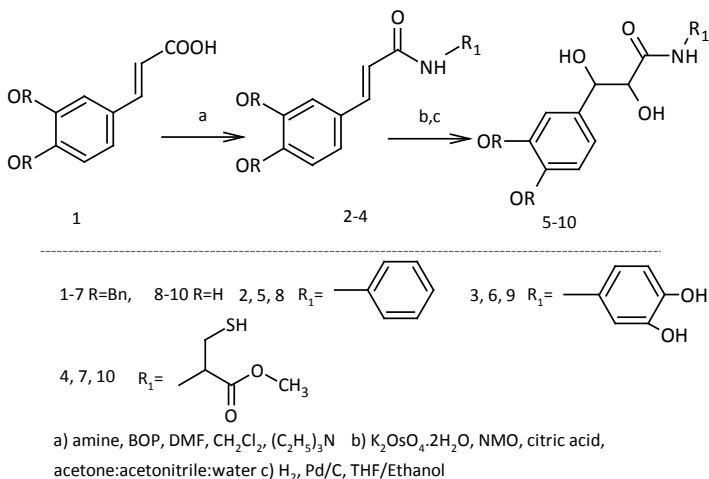
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PP 45. **SYNTHESIS OF SOME CAFFEIC ACID DERIVED AMIDES WITH
SUPPOSED ANTIOXIDANT ACTIVITY**

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Recently we reported about synthesis and antioxidant activity of 2,3-dihydroxy-3-(3,4-dihydroxyphenyl)-propionic acid, the synthetic monomer of natural polyether obtained from plants *Symphytum asperum* and *S.caucasicum*. Both the synthetic monomer and natural polyether showed high antioxidant activity [1]. The antioxidative activity of caffeic acid analogues depends on several factors such as the electron-donating and withdrawing substituents on the catechol ring, the number of hydroxyl groups or catechol moieties and the involvement of other H-donating groups (-NH, -SH) [2]. In order to compare the antiradical and antioxidative activity of some known caffeic acid amides with amides of 2,3-dihydroxy-3-(3,4-dihydroxyphenyl)-propionic acid, recently we have synthesized a series of caffeic acid amides and their dihydroxylated analogues (scheme 1). Dihydroxylation of benzylated caffeic acid amides (2-4) was carried out according modified Sharpless asymmetric dihydroxylation procedure. Deprotection of benzylic groups using hydrogenation on Pd/C gives amides (8-10) with free hydroxyl groups. The structures of new synthesized compounds were confirmed by NMR and IR-spectroscopy data. Antioxidant activity of amides will be investigated.



Scheme 1.

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PP 46. **INFLUENCE OF THE ORGANO-ZEOLITE SUBSTRATE ON
THE DEVELOPMENT OF THE PLANT ROOT SYSTEM**

**M. G. Zautashvili, T. G. Andronikashvili, L.G. Eprikashvili,
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Currently, hothouse soils (substrates) consisting of different components are widely used in practice of plant growing for various agricultural crops [1, 2].

Number of components contained in the substrate mainly does not exceed four. Substrates can be conventionally divided into two groups: soil-containing and soil not containing; the priority is given to the latter [3].

The objective of the presented study is to develop the effective substrate not containing soil. Brown coals of Akhaltsikhe deposits (Georgia) belonging to the humic-sapropelitic group and the class of lean brown coals have been used as an alternative to the soil [4]. These coals do not have significant practical utilization but they contain many organic substances in the form of water-insoluble humic acids which are inaccessible to plants as nutrient elements. Attempts have been made to use them in combination with the above minerals as the presence of these minerals in the substrate will promote transfer of the above organic substances (contained in brown coals) into their water-soluble forms.

Natural zeolites of sedimentary origin, soil and brown coals served as the initial materials for the preparation of substrate.

Natural zeolites – heulandite – clinoptilolite tuffs deposits of Tedzami, Khandaki site (Georgia). The content of the basic mineral in this rock varies within the limits of 70-80 % and calcium cations prevail in its composition [5]. Modification of zeolite by cations of ammonium and potassium cations was carried out by multiple treatment of the initial natural heulandite-clinoptilolite tuff with aqueous solutions of 0.1N NH_4Cl and KCl respectively. The brown coal was used as the second component of the substrate.

The weakly alkaline ($\text{pH}=7.3\text{-}7.9$) soil of meadow-cinnamonic type was used for the experiment. The soil is characterized by low content of humus (1.93 -2.90 %) and is attributed to heavy loams by its granulometric composition.

The experiment was carried out in vegetative pots, in three variants, each in three replications. The local variety of spring barley, «New Seed», was used as the test plant. Fifth sowings were done consecutively with appropriate processing of the results of each sowing. The beginning of the experiment: March, 2010; duration of the experiment: six months.

The change of the biomass of the grown plants in the process of exploitation of substrate was determined.

In the first variant the soil was used as a substrate (object of comparison).

In the second variant, the substrate was prepared by mixing the following finely grounded components (up to 1mm): 25 % zeolite modified by cations of ammonium, 25 % zeolite modified by potassium cations and 50 % soil.

The third variant - was the similar to the second one but 50 % of brown coal was used in the substrate instead of the soil.

Data expressing change in weight of the dry biomass of the plant root system depending on the sequence of sowing and type of substrate are given in the Table. As it is seen from the tabular data, highly interesting results requiring further experimental checking have been obtained. In the control variant (the soil), a regular decrease of total dry biomass of plant (barley) root system has been observed depending on the sequence of the sowing. On the contrary, in the second and mainly in the third variant (clinoptilolite + brown coal), an increase of root system total biomass takes place in the indicated sequence. In the fifth sowing of the third variant a total biomass of barley root system largely surpass that of plant grown on the control.

Table. Change of dry weight of the biomass of the plant root system depending on the sequence of sowing and type of substrate.

Type of substrate	Dry weight (g/pot) of the plant biomass, sequence of sowing				
	First sowing	Second sowing	Third sowing	Fourth sowing	Fifth sowing
1) Soil (control)	5.0	5.0	3.0	1.5	1.5
2) Zeolite-soil	1.25	2.0	9.6	13.75	19.5
3) Zeolite-brown coal	4.0	10.0	13.0	17.0	26.75

Thus, a new substrate has been developed on the basis of ammonium and potassium cation modified heulandite-clinoptilolite-containing tuffs and brown coal. This substrate is characterized by high bioproductivity of the plants grown on it and by possibility of its long-term, continuous utilization in plant growing.

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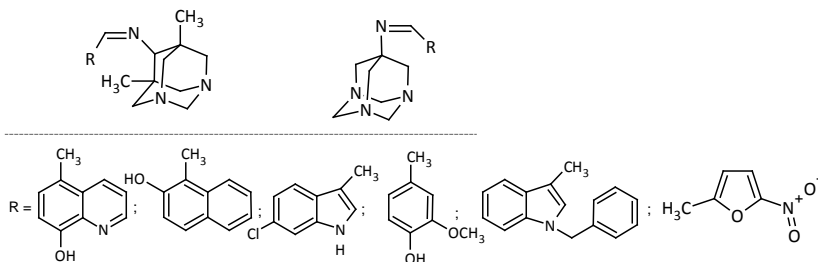
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PP 47. **SYNTHESIS AND ANTIBACTERIAL ACTIVITY OF SCHIFF BASE, CONTAINING AZAADAMANTANE GROUPS**

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Studies of antibacterial activity of various derivatives of 1,3-diazaadamantane found among them a number of compounds that inhibit the growth and development as gram-positive and gram-negative bacteria [1]. On the other hand, 7-amino-1,3,5-triazaadamantane known for its antiviral activity. The aim of our research was to combine azaadamantanes with structural fragments of known biologically active compounds, such as 8-oxyquenoline, 5-nitrofurane and others in one molecule. In view of this, we describe the synthesis and antibacterial activity of Schiff base derived from condensation of 6-amino-5,7-dimethyl-1,3-diaza- and 7-amino-1,3,5-triazaadamantanes with correspondent aldehydes, including pharmacophore groups.



Antibacterial activity of the compounds studied in vitro by methods "agar diffusion" and with serial dilutions of the microbial load of 20 million microbial bodies in 1 ml of medium. In the experiments were used gram-positive (*Staphylococcus aureus* 209p) and gram-negative (*Shigella dysenteriae flexneri* 6858; *E. coli* 0-55; *S. typhi* 79; *S. typhi* 31120-90) bacteria. Results have revealed that compounds with 8-oxyquenoline group showed high antibacterial activity, exceeding the control drug 5-NOK (nitroxoline) in half. In the study by serial dilutions revealed that the minimum inhibitory concentration (MIC) is 7.8-31.2 mg / ml (MIC 5-NOK – 62.5-125 ug / ml). The remaining compounds showed good moderate activity comparable to control drug 5-NOK and furazolidon.

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PP 48. **SYNTHESIS OF NITROSO GROUP CONTAINING N-GLYCOSIDES**

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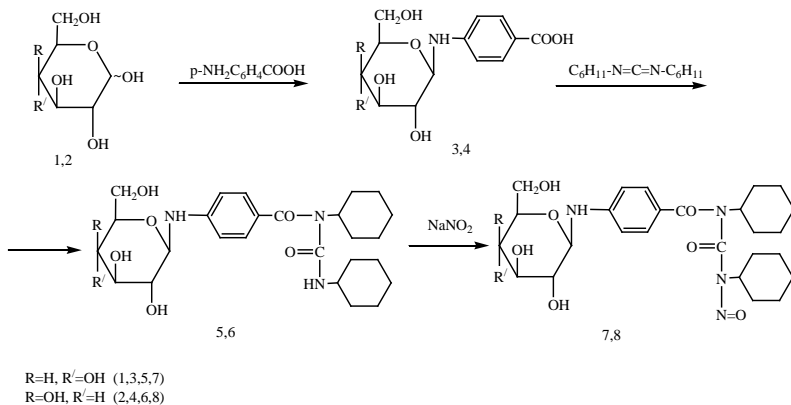
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Among the drugs offered in recently years for therapy of tumor-bearing patients, appeared as one of the most perspective derivatives of nitrosourea [1,2]. In this respect it seems important the synthesis of its new structural analogues with attraction of various amino acids, biogenic amines, some alkaloids and other biologically and pharmacologically active compounds.

Well known nitrosoalkylurea (NAU) possess polarity and can be used as an acceptor at formation of hydrogen bonds, nevertheless it is not enough hydrophilous to provide good solubility in water. In this respect typical NAU with low-polarity substituent are characterized with small solubility in water and good solubility in most of organic solvents. As most legible instance in this regard can be considered antibiotic streptozotocin (possessing high solubility in water and in low-polarity organic solvents), the derivative of nitrosomethylurea (NMU) and 2-deoxy-D-glucose. Expressed antineoplastic efficiency of this preparation in respect of some experimental tumoral and cellular culture and its specific diabetogenic action have formed the basis for application of streptozotocin in treatment of patients with metastasizing insuloma [3,4].

Recently the growing attention is attracted to the synthesis of the derivatives of nitrosourea. However the opportunities of all structural modifications of this class of compounds are still not exhausted.

The goal of present investigation consist in synthesis of N-glycosides containing in a molecule nitrosogroup ($N=O$). As an initial substance in the given work has been used the products of condensation of glucose (1), galactose (2) and *p*-aminobenzoic acids - *N-p*-carboxyphenyl- β -D-glucosyl(galactosyl)amine (3,4). By interaction of the last agent in usual peptide synthesis conditions with *N,N'*-Dicyclohexylcarbodiimide had been received *N*-urea (5,6). By interaction of compounds (5, 6) with sodium nitrite corresponding nitrosoderivatives (7,8) has been received. Reaction proceeds according to the following scheme:



The structures of obtained compounds were established by physical-chemical methods of analysis.

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PP 49. **THE CONDENSATION REACTIONS OF 1-CHLORO-2,3,4,6-TETRA-O-ACETYL- α -D-GLUCO(GALACTO)PYRANOSE WITH HETEROCYCLIC AMINES**

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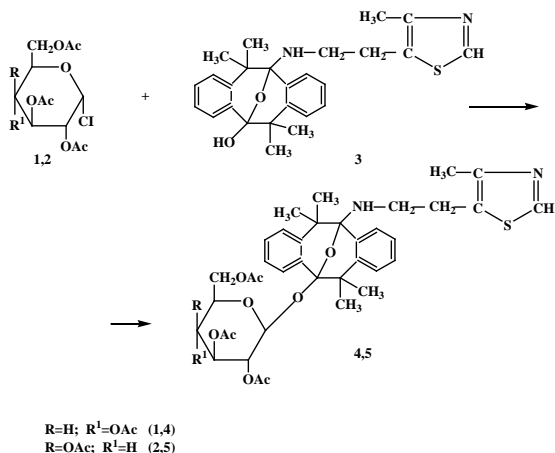
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Organosulfur compounds play important role in the processes of living organisms. This type of compounds is widely used in medicine, agriculture, and other industries [1,2].

Little has been published about carbohydrates containing heterocyclic compounds. However, such compounds are definitely of practical interest for synthesizing types of 1,2-*trans*-glycosides [3-5].

We propose a convenient method for synthesizing new types of heterocyclic derivatives of 1,2-*trans*-glycosides.

Condensation of 1-chloro-2,3,4,6-tetra-O-acetyl- α -D-glucopyranose (**1**) and 1-chloro-2,3,4,6-tetra-O-acetyl- α -D-galactopyranose (**2**) with 4,4,8,8-tetramethyl-2,3,6,7-dibenzo-9-oxabicyclo-(3,3,1)-nonan-1-N-(4-methylthiazolyethylamino)-5-ol (**3**) at room temperature in the presence of freshly prepared Ag_2CO_3 catalyst in ether solution produced **4** and **5**, respectively, according to Scheme 1,



The course of reactions was monitored by TLC. The reactions took 12-15 h to produce mainly 1,2-*trans*-glycosides **4** and **5** although small quantities of the 1,2-

cis-isomers were also observed. The products were yellow crystalline compounds that were soluble in CHCl_3 and alcohol (MeOH, EtOH).

These are nucleophilic substitution reactions that occur through an $\text{S}_{\text{N}}2$ mechanism. The direction of the reaction depends on the relative configuration of C_1 and C_2 in the starting acylated chloroglucose and chlorogalactose and on the acceptor of the released HCl. Condensation of 1,2-*cis*-acylglycosylhalides with alcohols in the presence of Ag_2CO_3 occurred mainly with C_1 configuration inversion, resulting in formation of 1,2-*trans*-glycosides [6].

The structures of obtained compounds were established by physical-chemical methods of analysis.

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PP 50. **ANALYSIS OF THE CARBO-HYDROGENES THROW OUT OF ASPHALT-CONCRETE ACTIVITIES**

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Indexes of air and heat balance determines protection of clean air in the atmosphere. Natural pollution sources of atmosphere do not cause any significant changes, but during natural disasters they have serious influence on the atmosphere and cause large-scale events of pollution. The main adjustable anthropogenic sources of atmosphere pollution are industrial, transport and household, in general, the field of human activity. The concentration of some minor substance, according to its toxic feature, also those substances whose concentrations also exceeds the upper limit of the norm is dangerous for the living organisms and for the natural environment. The level of pollution in the individual components of the environment requires a professional approach, because this situation is not clear in the beginning, the following is damaging for human health and has hazardous environmental impacts.

An important polluting actor of atmosphere, the basis of photo chemical smog is hydrocarbon emissions. They belong to the realm of drug action, cause seizures, skin and mucous membrane irritation, paralysis of respiratory centers, acting on the blood, blood making organs, central nervous system and etc. Hydrocarbon poisoning danger is caused by their volatility. Hence it is very important to protect carbon norms in the atmosphere.

The organized sources of hydrocarbon emissions from asphalt-concrete factories are: asphalt-concrete unit, bitumen copper, bitumen boiler, bitumen repository. From 38400t/m organized sources of asphalt concrete exudes 2.633t/m (0.6095g/s) hydrocarbon. An impact to their emissions has the region's climate-meteorological conditions. The maximum concentration of over ground hydrocarbon in the territory of enterprises is 0.80mac, but in the border of sanitary-protected zone (300m) it becomes 0.08 mac.

According to fulfill environmental protection legislative requirements, it is necessary: to classify and calculate the characters and sources of polluting hydrocarbons, to limit hydrocarbon emissions, to achieve and protect human health and safe environmental condition.

PP 51. **THE WAY OF COORDINATION OF ORTHO-AMINOPYRIDINE
METILDERIVATIVES WITH METALS (INFLUENCE OF SOLVENT ON
THE ABILITY OF COMPLEXCREATION)**

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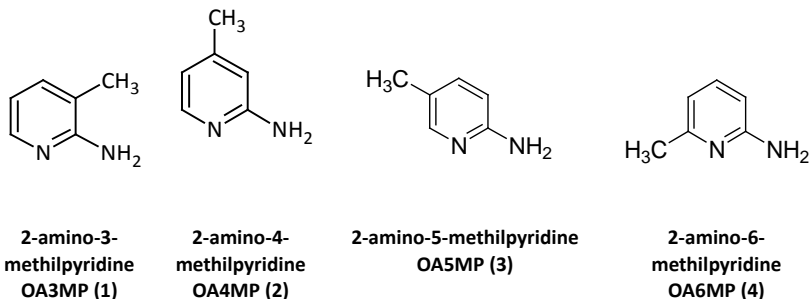
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With the method of quantum-chemical half empirical AM1, are calculated the power, geometrical and structural features of ortho-aminopyridine 3-, 4-, 5-, 6- metal-derivatives (image). Their electronic structure and co-ordination rule with ligand are ascertained.

We made the calculations with the method of quantum-chemical half empirical AM-1, which enabled us to explore the warmth of creation, dipole moment and distribution of electrons on atomic orbitals depending upon solvents.



Scheme 1. Structures of models of 2-aminopyridine methyl derivatives

As for the settlement of electrons on atomic orbitals and effective charges, the analysis showed, that nitrogen atoms N(7) and N(8) are characterized by high-value of electronic density. This image is the same for any molecule in any solvent.

According to the datas, the existence of π type inseparable electron pairs for the nitrogen N(7) atom excludes the creation of σ -connectivity of metal-nitrogen N(7).

The heterocycle nitrogen N(1) atom has σ -type inseparable electrons. More precisely, it has sp^2 type hybrid atomic orbital with S-composition, which determines the basic feature of heterocycle nitrogen N(1), i.e. his feature to create the donor-acceptance connectivity with metal.

According to the data given in the literature, are synthesized and studied Cobalt (II), Nickel (II), Copper (II) and Cadmium $LMX\hat{n}Sol$ type coordinated compounds, where L – are the Ligands explored by us; $X = Cl^-, NCS^-, SO_4^{2-}$; $M = Co(II), Ni(II), Cu(II), Cd$; Sol – water, methanol.

With the experimental explorations of structure and physical-chemical features of synthesized compounds (with absorption IR spectrum, electronic spectrum, reontgenographical method) are confirmed, that quantum-chemical calculations are in accordance with experimental data.

PP 52. **STUDY OF FLAVONIDS JUGLANS REGIA L. FROM THE FLORA OF AZERBAIJAN**

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Juglans regia L. (Greek Walnut), seed of Juglandaceae (walnut) is widely cultivated in the Caucasus, including in Azerbaijan [1,2].

Various organs of *J. regia* L. have been used at all times in the folk medicine in many countries of the world for various diseases. As, for example, roots and peel are used for repair of wound with rickets. In the Islamic Republic of Iran, the ointment is used for hemorrhoids. Broths of the trunk are used for ulcers, tumors, venereal diseases, and skurofleze. Preparations from the leaves and the pericarp have phytoncide, protistotside and antibacterial properties.

In Bulgaria and in the former Soviet Union, tinctures and pot liquors are used in the chronic eczema, ringworm, exudative diathesis, blotches, carbuncles, pulmonary, skin and other forms of tuberculosis, for treatment of diabetes, gout, in gastric disorders and enhancing hair growth. It has anthelmintic, insecticidal, ichtiotside properties.

Flavonoids from the leaves have hypotensive, antispasmodic and anti-inflammatory effect in experiments made on animals. Unripe fruits and leaves are a source of vitamin C.

Oil obtained from ripe fruit improves liver and stomach.

In various organs of *J. regia* L. were revealed flavonoids, hardening agent, quinones, and other biologically active substances [3].

However, *J. regia* L., cultivated in Azerbaijan, has not been studied from the chemical and pharmacological aspects.

We studied the flavonoids of the leaves of *J. regia* L., collected from three regions of Azerbaijan: Cuba, Shamakhi and Aghdash.

In June 2010, 95% ethanol was extracted from 5 kg freshly harvested leaves. The extracts were combined and evaporated with a water pump to the water residue, treated successively with chloroform and ethyl acetate-hexane. By preparative chromatography on paper (Filtrak 5) there have been derived substances 1 and 2. The substance 3 has been received from the ethyl acetate extract.

Substance 1 – luteolin (5,7,3', 4' - tetrahydroksiflavin) composition $C_{15}H_{10}O_6$, m.p. 328-330 °C (from ethanol). UV spectrum (λ_{max} nm, methanol: 242 sq., 253, 267,

291 sq., 349. Substance 2 - meletin, (3,5,7,3',4' - penta-hydroxy-phlorin) - composition $C_{15}H_{10}O_7$, yellow needles, 307-309 °C (from ethanol). The UV spectra (λ_{max} nm), methanol: 370, 256; CH_3COONa : 380, 258.

Substance 3 - hyperoside (3-O-D- β -galactopyranoside, 5, 7, 3', 4'tetra- hydroxy-phlorin) – composition: $C_{21}H_{20}O_{12}$, etc. 230-232 °C, $[\alpha]_{20} - 45^\circ$ (c 0.1, dimethyl formamide), UV spectrum (λ_{max} : nm), methanol 350, 255, 265. R_f 0.68 (4:1:5, Filtrak FN 5). The cyanidine test shows that the substance is flavonols glycoside [4]. The substance 3 is laminated into quercetin (63.8%) and D-galactose in case of acid digestion.

All selected materials have been identified on the basis of physical characteristics, and spectral data with authentic samples [4,5].

It is established that luteolin has anti-tumor, anti-allergic, anti-inflammatory and antioxidant activity; lowers cholesterol and triglycerides in the blood [6-9]. It should be noted that hyperoside has choleric and cardiogenic effect [10].

It should be noted that the flavonoid composition of all three samples has the same quality.

Studies of chemical components of *J. regia* L. are extended.

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PP 53. **SYNTHESIS OF 1H-PIRROLO[3,2-h]PHTALAZINE-6,9-DION**

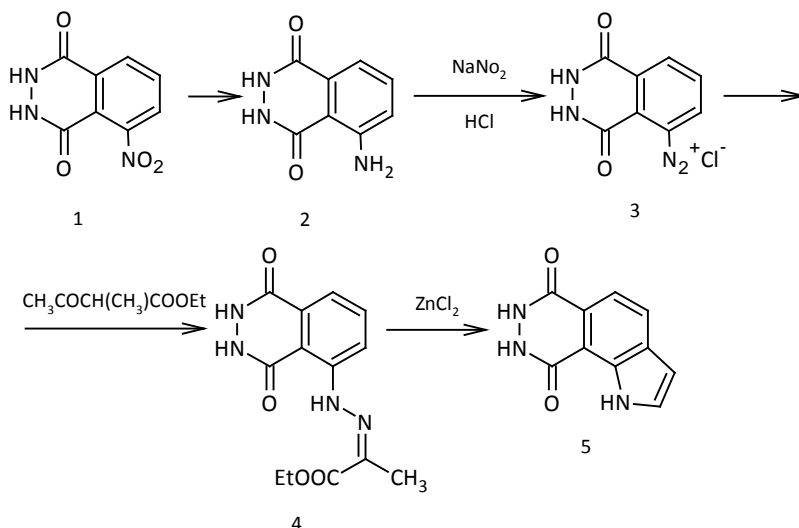
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Some compounds of phthalhydrazines are used as therapeutic agents in therapy. 1-(2-aminoethylamino)-4-(p-chloranilin)phthalazine shows antimalarial activity against avian malaria type [1]. 2-phenil-4-oxsophtalazones showed high tuberculostatic activity against *Mucobacterium tuberculosis* [2,3]. Many phthalhydrazones are characterized by hypotension ability [4]. Hydrazinophthalazines have effect upon central nervous system showing hypophysis effect, they have adrenolytic properties as well and regulate blood pressure [3].

Phthalhydrazines are 1,4-diketo derivatives of tetrahydrophtalazines. Phthalhydrazines exist mainly in the form of dions [4]. Phthalhydrazines are obtained generally by way of condensation of phthalic acid with hydrazine. Phthalic acids, their ethers, anhydrides and amides react with hydrazines giving Phthalhydrazines. By reaction between aminophthalazones and nitric acid respective Phthalhydrazines are obtained. Phthalhydrazines are inert against electrophilic substitution.

Our objective was obtaining 1H-pirrolo[3,2-h]Phtalazine-6,9-dion according to the following scheme:



Hydrazone (4) was obtained by dinitration of 5-aminophthalaze-1,4-dion hydrochloride (2) obtained by chemical action of SnCl_2 on 5-nitrophthalaze-1,4-dion (1) and by reducing of excreted diazonium salt (3). 1H-pirrolo[3,2-h]phtalazine-6,9-dion(5) was obtained by cyclization of the latter compound.

Composition and structure of synthesized compounds is determined by element analysis and physical methods of investigation.

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PP 54. **CHEMICAL STRUCTURE AND MECHANISM OF ACTION OF
SELECTIVE ESTROGEN RECEPTOR MODULATORS**

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It is true that selective estrogen receptor modulators (SERM) are characterized by high affinity in relation to the receptors; however, they are absolutely different from each other according to their chemical structure as well as to their main pharmacological characteristics. That is why the aim of our work was to study the connection between the chemical structure, mechanism of action and main effects of the drugs.

Estrogen receptors belong to the group of transcription-regulating receptors. The female gonadal hormone estradiol is an agonist at these receptors. Several drugs are available that can produce estrogen-antagonistic effects. Interestingly, these are associated with estrogen-agonistic effects in certain tissues. A tentative explanation derives from the idea that each ligand induces a specific conformation of the estrogen receptor. The ligand–estrogen receptor complexes combine with co-activators or repressors at specified gene sequences. The pattern of co-regulators differs from tissue to tissue, allowing each SERM to generate a tissue-specific activity. It is of therapeutic significance that the patterns of estrogenic and antiestrogenic effects differ in a substance-specific manner among the drugs of this class. It is useful to compare the activity profile of a SERM with that of estradiol, particularly in relation to effects seen postmenopausally [3]. During chronic administration of estradiol, the risk of endometrial cancer rises; co-administration of a progestin prevents this effect. Breast cancers occur more frequently, likewise thromboembolic diseases [3]. Estradiol effectively alleviates climacteric hot flashes and sweating. After chronic treatment it reduces the incidence of osteoporotic bone fractures by preventing the loss of an estrogen-dependent portion of bone mass. Nonetheless, estrogens can no longer be recommended for this purpose because of the unfavorable benefit–risk constellation (table).

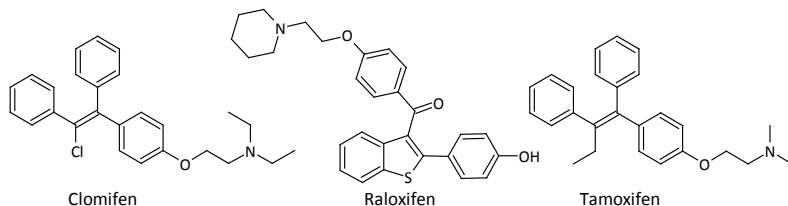
Both Clomifen and Tamoxifen are stilbene derivatives (Figure). Clomifen is generally used orally for the therapy of female infertility [1,3–6]. It suppresses estrogen receptors in the adenohypophysis, helps the release of FSH and stimulates the maturation of oocyte follicles. The concentrations of estradiol increases in the blood and, therefore, there is a high risk of developing an estrogen–positive cancer. At the first stage of the treatment in case of the high dosage of the drug we may encounter quite a severe ovarian hyperstimulation syndrome with fatal results that requires monitoring during the therapy period. Unlike Clomifen Tamoxifen is a classic peripheral antiestrogen and block the estrogenic stimulus for tumor cell

growth of breast cancer. The drug is highly effective during the treatment of estrogenpositive cancer in the postmenopause even in the regime of monotherapy [2]. We often encounter the following adverse affects: thrombophlebite, osteoporosis, anorexia, depression and retinopathy. The structure of Raloxifen consists of heterocycles (Figure) and unlike antiestrogens it strengthens anabolic processes (protein biosynthesis) in the bony tissues. The main purpose of prescribing this drug is the treatment of osteoporosis caused by the deficiency of estrogens.

Table. Adverse effects of selective estrogen receptor modulators

Adverse Effects	Estradiol	Clomifen	Tamoxifen	Raloxifen
Ovarian hyperstimulation syndrome	–	+	–	–
Breast cancer risk	+	+	–	–
Endometrial cancer risk	+	+	+	–
Thromboembolism	+	+	+	+
Relief of climacteric complaints	+	+	–	–
Bone mass	+	+	–	+
Retinopathy	–	–	+	–

To sum up, selective estrogen receptor modulators – Clomifen and Tamoxifen are stilbene derivatives according to their chemical structure [2,4]. They block estrogen receptors on various levels but have the carcinogenic effects that should be taken into account while using this medicine for a long time. At the expense of heterocycle Raloxifen has the characteristics of agonist in relation to the estrogen receptors and in this way it inhibits the development of osteoporosis.



Scheme. Chemical structure selective estrogen receptor modulators

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PP 55. **ABOUT DEVELOPMENT IN CHEMISTRY AND APPLICATION OF
CONDENSED PHOSPHATES**

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The ability of condensation of phosphoric anions is recognized approximately two centuries. The chemistry of inorganic compounds of phosphorous has developed intensively in the last few years for the reason that, first, the phosphate compounds are most suitable for further development of the chemistry of inorganic polymers, and, second, they are finding ever increasing practical application as fertilizers, detergents and as materials used in engineering and construction." [1]. In fact the chemistry of condensed phosphates has taken a long time to develop, but last years many important research studies are realized and examined [2-6].

The spheres of application of condensed phosphates are very variable, such as: raw materials for creation of phosphates glasses, thermo-resistant materials, effective applying fertilizers, detergents, cement substances, ion-exchange materials and also catalytic agents [1,5,6]. The composition and thermal properties, as well as the vibrational and luminescent properties of compounds determine their use in quantum electronics; The bio-materials appears on the base of hydroxiapatite and polyphosphates; Fundamental researches concerning double, triple, polymeric and substituted phosphates, where oxygen's atoms are interchange by nitrogen, fluorine and sulphur's atoms are executed [6].

Application of phosphates is so large; a new trend in the art avowed as "Thermophosphate Pictorial Art" is developed by O.Pavlov. He has developed mineral as well as phosphate paints in three forms: thermo phosphate paints, powder colours, pastel and artistic colours.

The contribution of academician I.V. Tananaev, Dr. N. Chudinova, Dr.I. Grunze, as well as Dr. A. Durif, and Dr. MT. Averbuch-Pouchot in the development of chemistry of phosphates are undoubted.

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PP 56. **SOME INVESTIGATIONS WHICH LEAD TO THE
CHARACTERIZATION OF THE NEW GROUP OF INORGANIC
POLYMERS-CONDENSED PHOSPHATES**

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Condensed phosphates of polyvalent metals, notably double phosphates containing alkali metals possess a number of rather interesting and valuable, appreciable properties, which explains prospects of their application.

High thermal stability, elevated content of phosphorus – these preconditions have caused their application as raw components for manufacture of phosphates glasses, the use of crystalline and non crystalline ultraphosphates in quantum electronics are predetermined by specific properties.

Numerous cyclophosphates with diverse formula were obtained and described in chemical literature last 30 years; Built up by a ring of corner-sharing PO_4 tetraedra, the general formula of anions is $\text{P}_n\text{O}_{3n}^{n-}$. Actually anions are known for $n=3, 4, 5, 6, 8, 9, 10$ and 12 [1-3].

We synthesized many new double cyclophosphates, whose general properties we have examined [3-6]: systematic investigation of $\text{M}'_2\text{O}-\text{M}^{\text{III}}_2\text{O}_3-\text{P}_2\text{O}_5-\text{H}_2\text{O}$ at $130^\circ\text{C}-550^\circ\text{C}$, where M' = alkali metals and M^{III} – Ga, In, Sc. In addition investigation of system $\text{Ag}_2\text{O}-\text{M}^{\text{III}}_2\text{O}_3-\text{P}_2\text{O}_5-\text{H}_2\text{O}$ at $150^\circ\text{C}-400^\circ\text{C}$ is on the stage of examination. Many compounds were wholly examined and the structures are determined by X-ray structural techniques [4-6].

Presented data are the results of our studies: synthesis, analysis, examination of the experimental records, their comparison and correlation with achievements in the domain of inorganic polymer's chemistry [3-6, 2, 7].

The first representatives of cyclooctaphosphate class – $\text{K}_2\text{Ga}_2\text{P}_8\text{O}_{24}$ and $\text{Rb}_2\text{Ga}_2\text{P}_8\text{O}_{24}$ were obtained by M.Avaliani & N. Chudinova, crystal structure was examined [5-6]. The figures 1 - 2 represents the structures of $\text{K}_2\text{Ga}_2\text{P}_8\text{O}_{24}$ (reminds crown-ether) and $\text{Cs}_3\text{Ga}_3\text{P}_{12}\text{O}_{36}$.

More of 60 new formerly unknown double condensed phosphates have been obtained, including one of primary synthesized cyclododecaphosphates, e.g. $\text{Cs}_3\text{Ga}_3\text{P}_{12}\text{O}_{36}$ (fig.2), $\text{Cs}_3\text{Sc}_3\text{P}_{12}\text{O}_{36}$, $\text{Cs}_3\text{In}_3\text{P}_{12}\text{O}_{36}$ (see also important publications [7,1]).

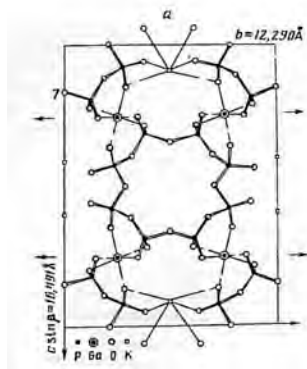


Figure 1. Structure of $K_2Ga_2P_8O_{24}$ along axis X

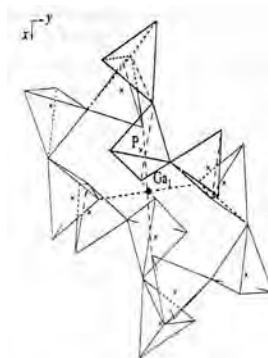


Figure 2. Structure of $Cs_3Ga_3P_{12}O_{36}$

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PP 57. **SYNTHESIS AND BIOLOGICAL ACTIVITY OF CONDENSED
THIENO[2,3-b] PYRIDINES**

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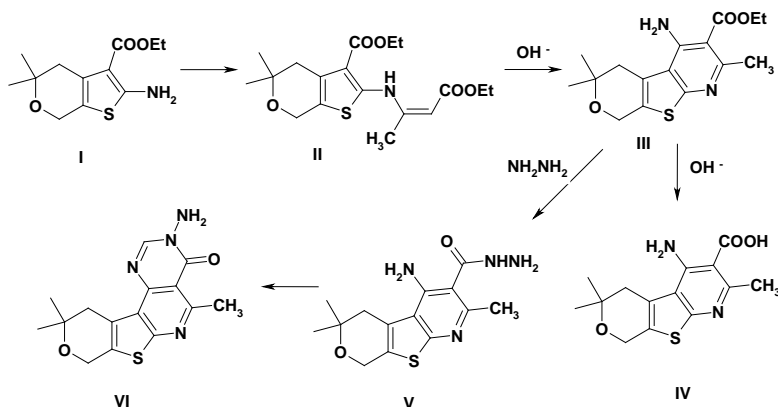
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Condensed pyrimidines are known to have various biological activities, specifically, pronounced anticonvulsive activity.

In this work we report synthesis of condensed pyrimidines of a new class and their derivatives representing modified analogs of the afore-mentioned compounds.

Modified analogs allow determining comparative influence of substituents and modified cycle on biological activity.

The methods of production envisage application of not only transamination reaction between 2-amino-3-ethoxycarbonyl thiophenes (I) and ethyl- β -amino crotonic ester, but also further cyclization of the synthesized compound (II) in the alkaline medium (III). The obtained compound in the alkaline medium easily transforms into the appropriate acid (IV). In case of hydrazine hydrate, cyclocondensation of the synthesized carbazoyl derivative (V) with ortho-formiate affords thieno-[2,3-b]-pyridines (VI).



Biological investigations have shown that substitution of pyrimidine with pyridine in the molecule results in decrease of anticonvulsive activity while in the case of availability of pyrimidine cycle in the molecule – in sharp rise of the stated activity.

PP 58. ARYLSULFONYLATION OF 2-CHLOROMETHYLBENZIMIDAZOLE

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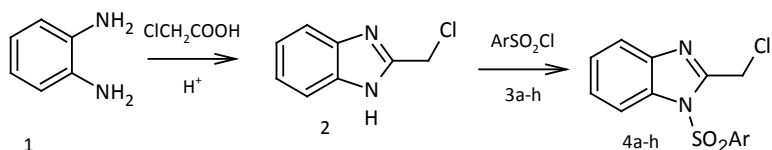
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High biological activity and wide action spectra of benzimidazole derivatives, among them found the substances with different pharmacological and pesticide activities, cause the higher interesting of them [1-3].

Early we investigated interaction of 2-hydroxymethylbenzimidazole with arylsulfochlorides in presence of triethylamine using stehiometric amounts of reagents and show, that observed formation the 1-arylsulfonyl-2-chloromethylbenzimidazoles equally with 1-arylsulfonyl-2-hydroxymethylbenzimidazoles (in ratio 9:1). Increasing of the arylsulfochlorides amount causes to increase the portion of the last.

In the present article we carried out the synthesis of 2-chloromethylbenzimidazole **2** and study its arylsulfonylation. The synthesis of the compound **2** was put by cyclisation o-phenyldiamine **1** with chloroacetic acid in acidic medium.

Reaction of the compound **2** with arylsulfochlorides **3 a-h** in presence of triethylamine at room temperature in acetone results to 1-arylsulfonyl-2-chloromethylbenzimidazoles **4 a-h** with high yields.



3,4a Ar=Ph, **b**=Ar=4-MeC₆H₄, **c** Ar=4-MeOC₆H₄, **d** Ar=4-ClC₆H₄, **e** Ar=3-NO₂C₆H₄, **f** Ar=4-*t*-BuC₆H₄, **g** Ar=2,4-Me₂C₆H₃, **h** Ar=3,4-Me₂C₆H₃

The structures of the synthesized compounds were confirmed by modern physical chemical methods.

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PP 59. ABOUT REGIOSELECTIVE ARYLSULFONYLATION OF
2-AMINO BENZIMIDAZOLE

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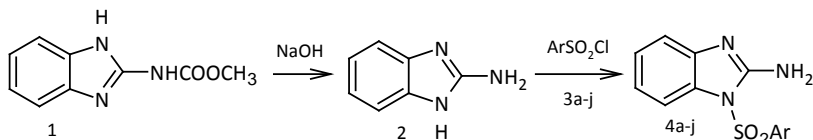
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Among the derivatives of benzimidazole the substances with different biological activities [1-3] were found, and substances with tuberculostatic actions are available in the line of sulfonylamide derivatives [4].

It is known, that 2-aminobenzimidazole in the acylation reactions reveals dual reaction ability, forming the 1-acyl-2-aminobenzimidazoles and 2-acylamino benzimidazoles. Besides, that 1-acyl-2-aminobenzimidazoles are thermodynamically non-stable and slightly regroups into stable 2-acylamino benzimidazoles. Therefore, it is interesting the investigation of the arylsulfonylation of 2-aminobenzimidazole **2**.

Compound **2** was synthesized by alkaline hydrolysis of 2-methoxycarbonylamino benzimidazole **1**. By interaction of the stehiometric amounts of the compound **2** with arylsulfochlorides **3a-j** in presence of triethylamine it was shown, that reaction proceeded regioselectively on endocyclic nitrogen atom forming 1-arylsulfonyl-2-aminobenzimidazoles **4a-j**. The products of arylsulfonylation on exocyclic amino group – 2-arylsulphonylamino benzimidazoles were not found.



3,4a Ar=Ph, **b**=Ar=4-MeC₆H₄, **c** Ar=4-MeOC₆H₄, **d** Ar=4-ClC₆H₄, **e** Ar=3-NO₂C₆H₄, **f** Ar=4-*t*-BuC₆H₄, **g** Ar=2,4-MeCONHC₆H₄, **h** Ar=2,4-Me₂C₆H₃, **i** Ar=3,4-Me₂C₆H₃, **j** Ar=2,4,6-Me₃C₆H₂

The structures of the synthesized compounds were confirmed by IR, ¹H NMR spectroscopy, mass-spectrometry and X-ray data.

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PP 60. **NOVEL BIFUNCTIONAL BIOTIN CHELATOR FOR COMPLEXATION
OF THE $[M(CO)_3]^+$ CORE (M= ^{99m}Tc AND Re).
SYNTHESIS, CHARACTERIZATION AND IN VITRO STUDIES**

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Radiolabeled biotin analogs are used in cancer radioimmunotherapy, by pretargeting tumor cells with avidinylated antibodies. In our work, we focused on the development of biotin analogs for $[^{99m}Tc/^{188}Re(CO)_3]$ labeling. These radionuclides have nuclear properties suitable for use in radiopharmaceuticals and the $[M(CO)_3]$ system is used particularly because of its high *in vivo* stability. Recently, we reported a potent imidazol-containing chelator capable of forming stable rhenium(I)- and technetium(I)-tricarbonyl complexes and herein we present the syntheses of the bifunctional biotinylated analogue, L1 and its Re and Tc complexes.

L1 was synthesized by conjugation of biotin with 2-(2-aminoethylthio)-3-(1H-imidazol-4-yl)propanoic acid via amide bond formation. The latter was synthesized in a two-step reaction from L-histidine. The *fac*- $[Re(L1)(CO)_3]$ complex, Re1, was prepared by reacting the precursor $[NEt_4]_2[ReBr_3(CO)_3]$ with an equimolar amount of L1 in methanol. RP-HPLC analysis revealed one major peak. Re1 was characterized by spectroscopic methods $^1H/^{13}C$ NMR and FT-IR. The spectroscopic data indicate that L1 is coordinated as a NSO tridentate chelator with rhenium(I), via the N(π) imidazol nitrogen, the S thioether and the O carboxylate.

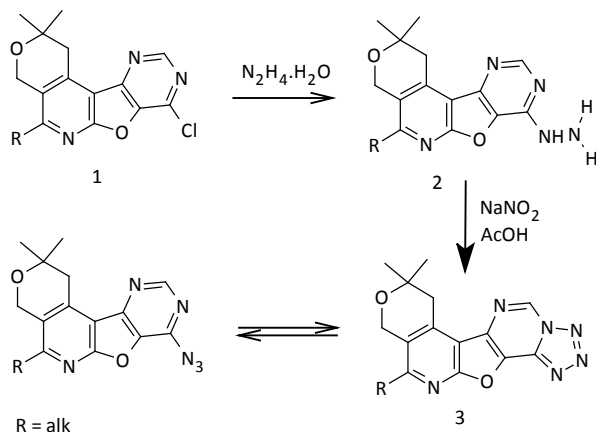
The tracer *fac*- $[^{99m}Tc(L1)(CO)_3]$ complex, $^{99m}Tc1$, was synthesized in high yield by reacting the precursor *fac*- $[^{99m}Tc(OH_2)_3(CO)_3]^+$ with μ molar concentration of L1 and was identified by comparative RP-HPLC using the characterized Re1 as reference. $^{99m}Tc1$ was stable in 1mM L-histidine and 1mM L-cysteine over 24 hours. High affinity binding of $^{99m}Tc1$ with avidin was observed in preliminary *in vitro* experiments. More *in vitro* and *in vivo* biological evaluation experiments of $^{99m}Tc1$ are currently underway.

PP 61. **SYNTHESIS OF NEW CONDENSED HETEROCYCLES: 11-ALKYL-8,8-DIMETHYL-7,10-DIHYDRO-8H-PYRANO[4",3":4,5']PYRIDO[3',2':4,5]-FURO [2,3-e][1,2,3,4]TETRAZOLO[1,5-c]PYRIMIDINES**

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The present work is the continuation of our previous studies on synthesis of condensed derivatives of furo[3,2-d]pyrimidines. Here we report about the synthesis of new condensed heterocycles: tetrazolo[1,5-c]pyrimidines. As starting compounds, we used 8-chlorine derivatives of pyrano[3,4-c]pyridines **1** previously obtained by us [1]. Reaction of the latter compounds with hydrazine hydrate affords 8-hydrazinofuro[3,2-d]pyrimidines **2**. Further, under the action of NaNO_2 in acetic acid, hydrazines were converted into condensed tetrazolo[1,5-c]pyrimidines **3**.



Worth mentioning, that in above systems the tetrazole-azide tautomerism is present, which is confirmed by the results of ^1H NMR investigation.

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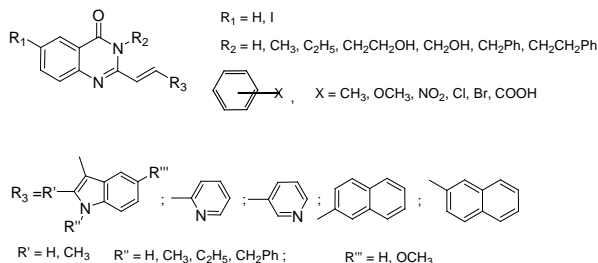
PP 62. **SYNTHESIS OF NEW 2,3-DISUBSTITUTED 3,4-DIHYDRO-4-QUINAZOLONES**

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It is known that derivatives of quinazolones have strongly expressed antimicrobial, antiinflammatory, anticonvulsant and analgesic activity. Therefore, the search for new biologically active compounds containing quinazalone fragment, and study their biological activity is actual. On the other hand, it is known that compounds containing in their structure indole, pyridine, or naphthyl rings have a broad spectrum of pharmacological action. For example, in medical practice successfully applied indole derivatives (diazolin, indomethacin, indopan), pyridine (kardiamin, isoniazid) and etc. The combination of quinazalone ring with these pharmacophore groups could lead to new biologically active compounds.

The aim of our research was the synthesis of derivatives of 3,4-dihydro-4-quinazalone containing in second and third positions various aliphatic, aromatic and heterocyclic groups. The last ones are synthesized by cyclization acetylanthranilic acid by known method [1] with various primary amines, with subsequent condensation of received 3-substituted 2-methyl-3,4-dihydro-4 quinazolones with indolyl-, pyridyl- or naphthylaldehyde.



The structure of the synthesized compounds was confirmed by an elemental analysis, IR, NMR ^1H and mass spectra. Work on the synthesis and study of the biological properties of the compounds is continuing.

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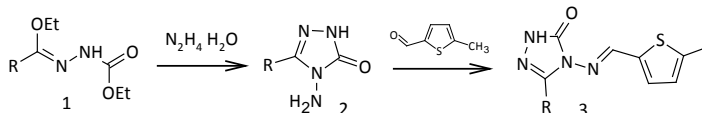
PP 63. **PREPARATION AND IN-VITRO ANTIOXIDANT ACTIVITIES OF SOME NOVEL HETEROCYCLIC SCHIFF BASES HAVING 4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONE RING**

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Antioxidants are extensively studied for their capacity to protect organism and cell from damage that is induced by the oxidative stress. A great deal of research has been devoted to the study of different types of natural and synthetic antioxidant. A large number of heterocyclic compounds, containing the 1,2,4-triazole ring, are associated with diverse biological properties such as antioxidant, anti-inflammatory, antimicrobial and antiviral activity. Exogenous chemicals and endogenous metabolic processes in human body or in food system might produce highly reactive free radicals, especially oxygen derived radicals, which are capable of oxidizing biomolecules by resulting in cell death and tissue damage. Oxidative damages play a significantly pathological role in human diseases.

In this study, new 3-alkyl(aryl)-4-(5-methyl-2-thienymethyleneamino)-4,5-dihydro-1H-1,2,4-triazol-5-ones (**2**) were synthesized by the reactions of 3-alkyl(aryl)-4-amino-4,5-dihydro-1H-1,2,4-triazol-5-ones (**1**) with 5-methyl-thiophene-2-carboxaldehyde. The structures of nine new compounds are established from the spectral data. Then the antioxidant properties of the compounds were studied and evaluated using different three antioxidant assays, including reducing power, free radical scavenging and metal chelating activity. For the measurement of the reductive ability, Fe^{3+} - Fe^{2+} transformation was investigated in the presence of compound using by the method of Oyaizu [1]. The hydrogen atoms or electrons donation ability of the synthesized compound was measured by DPPH \cdot using the method of Blois [2]. The chelating effect of ferrous ions by the compound was determined according to the method of Dinis et al [3]. BHT, BHA and α -tocopherol were used as reference antioxidant compounds.



where 1-3: a: $\text{R}=\text{CH}_3$, b: CH_2CH_3 , c: $\text{CH}_2\text{CH}_2\text{CH}_3$, d: $\text{CH}_2\text{C}_6\text{H}_5$, e: $\text{CH}_2\text{C}_6\text{H}_4\text{CH}_3$ (p), f: $\text{CH}_2\text{C}_6\text{H}_4\text{OCH}_3$ (p), g: $\text{CH}_2\text{C}_6\text{H}_4\text{Cl}$ (p), f: $\text{CH}_2\text{C}_6\text{H}_4\text{Cl}$ (m), i: Ph

References

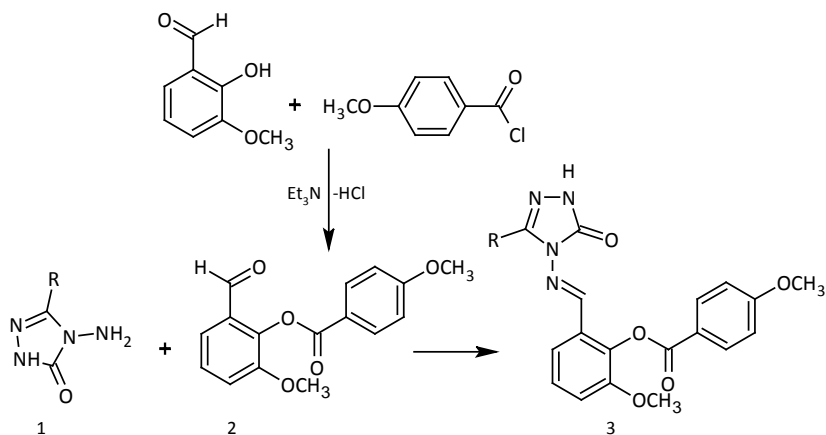
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PP 64. **SYNTHESIS AND NON-AQUEOUS MEDIUM TITRATIONS OF SOME NEW 3-ALKYL(ARYL)-4-[2-(4-METHOXYBENZOXY)-3-METHOXY-BENZYLIDENAMINO]-4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONES**

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It is known that 4,5-dihydro-1H-1,2,4-triazol-5-one ring has weak acidic properties, so some 4,5-dihydro-1H-1,2,4-triazol-5-one derivatives were titrated potentiometrically with tetrabutylammonium hydroxide in non-aqueous solvents, and the pK_a values of the compounds were determined [1-3]. In the present study, seven new 3-alkyl(aryl)-4-[4-(3-methoxy-4-methoxybenzoxy)-benzylidenamino]-4,5-dihydro-1H-1,2,4-triazol-5-ones (**3**) were synthesized from the reactions of the corresponding 3-alkyl(aryl)-4-amino-4,5-dihydro-1H-1,2,4-triazol-5-ones (**1**) with 3-methoxy-4-methoxybenzoxy-benzaldehyde (**2**), which was obtained from the reaction of 3-hydroxy-4-methoxybenzaldehyde with p-methoxybenzoyl chloride by using triethylamine. The new compounds synthesized were characterized by using IR, 1H -NMR, ^{13}C NMR and UV spectral data together with elemental analysis. In addition, to investigate the effects of solvents and molecular structure upon acidity [1-4], the prepared **1** type compounds were titrated potentiometrically with tetrabutylammonium hydroxide in four non-aqueous solvents, including acetone, isopropyl alcohol, DMSO and *N,N*-dimethylformamide. The half-neutralization potential values and the corresponding pK_a values were determined for all cases.



1,3 R = a:CH₃; b: Et, c:Pr; d:Bn; e: CH₂C₆H₄CH₃(*p*); g: CH₂C₆H₄Cl(*p*); i:Ph

References

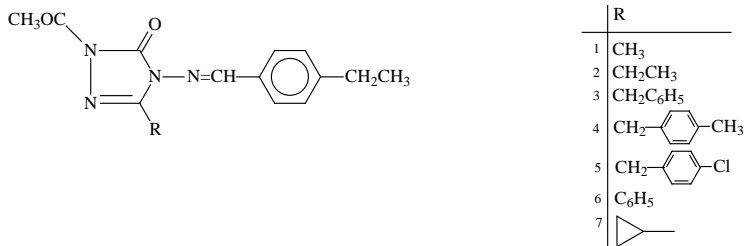
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PP 65. **B3LYP DENSITY FUNCTIONAL CALCULATIONS OF ^1H AND ^{13}C NUCLEAR SHIELDING CONSTANTS OF SOME 4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONE DERIVATES**

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Isotropic ^1H and ^{13}C nuclear magnetic shielding constants of some 1-acetyl-3-alkyl (aryl)-4-(4-ethylbenzylidenamino)-4,5-dihydro-1H-1,2,4-triazol-5-one compounds which were synthesized and described in the literature [1]. The values ^1H -NMR and ^{13}C -NMR of compounds have been calculated employing the gauge-including-atomic-orbitals (GIAO) method at the B3LYP/6311G(d) and HF/631G(d,p) density functional level of theory. The geometry of each compound has been optimized employing a 6-311G basis set [2]. Theoretical trends are compared with the experimental data. All calculations were performed with the Gaussian G03 Rev C0₂ suite programs [3]. The structure of the studied compounds may be represented as follows:



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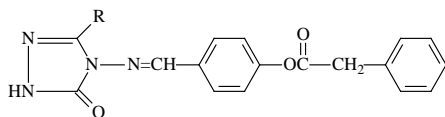
PP 66. **GIAO NMR CALCULATIONS OF SOME 3-ALKYL(ARYL)4-(4-PHENYLACETOXYBENZYLIDENAMINO)-4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONES: COMPARISON OF THEORETICAL AND EXPERIMENTAL ^1H AND ^{13}C CHEMICAL SHIFTS**

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The Gauge-including atomic orbital (GIAO) [1] method for calculating ^1H and ^{13}C nuclear magnetic shielding tensors at the density functional level of theory (DFT) is applied to some 3-alkyl(aryl)4-(4-phenylacetoxybenzylidenamino)-4,5-dihydro-1H-1,2,4-triazol-5-one derivatives. GIAO/DFT-B3LYP/6311G (d) and HF / 631G (d,p) methods were applied on the optimized B3LYP/6311G (d) and HF / 631G (d,p) geometries [2]. All calculations were carried out using Gaussian G03 Rev. C02 package. The first reference was used for the experimental ^1H and ^{13}C -NMR spectrum values which are essential for the study [3].

The structure of the compounds may be represented as follows.



	R
1	CH ₃
2	CH ₂ CH ₃
3	CH ₂ CH ₂ CH ₃
4	CH ₂ C ₆ H ₅
5	CH ₂ -
6	CH ₂ -
7	CH ₂ -
8	CH ₂ -
9	C ₆ H ₅

References

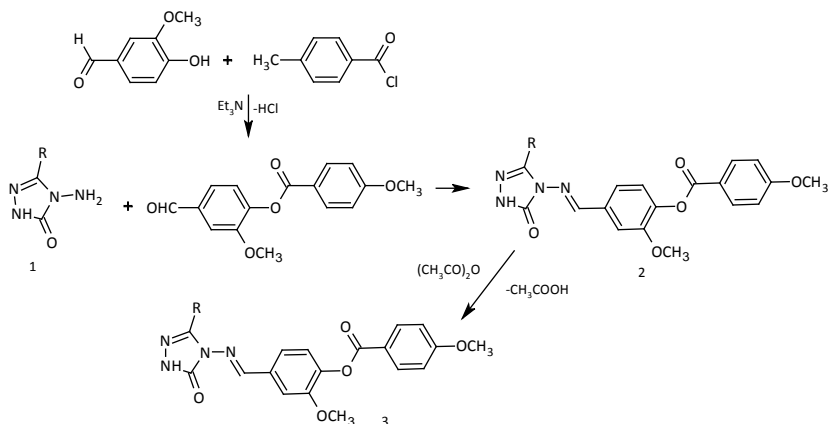
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PP 67. **SYNTHESIS AND GIAO NMR CALCULATIONS FOR SOME NOVEL 1-ACETYL-3-ALKYL(ARYL)-4-[3-METHOXY-4-(4-METHYLBENZOXY)-BENZYLIDENAMINO]-4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONES**

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In this study, six 1-acetyl-3-alkyl(aryl)-4-[3-methoxy-4-(4-methylbenzoxy)-benzylidenamino]-4,5-dihydro-1H-1,2,4-triazol-5-ones (**3**) were synthesized from the reactions of 3-alkyl(aryl)-4-[3-methoxy-4-(4-methylbenzoxy)-benzylidenamino]-4,5-dihydro-1H-1,2,4-triazol-5-ones (**2**) with acetic anhydride and characterized by elemental analyses and IR, ¹H-NMR, ¹³C-NMR and UV spectral data (Scheme 1). The starting compounds 3-alkyl(aryl)-4-[3-methoxy-4-(4-methylbenzoxy)-benzylidenamino]-4,5-dihydro-1H-1,2,4-triazol-5-ones (**2**) were prepared by the reactions of the corresponding 3-alkyl(aryl)-4-amino-4,5-dihydro-1H-1,2,4-triazol-5-ones (**1**) with 3-methoxy-4-hydroxybenzaldehyde as described in the literature [1]. In addition, isotropic ¹H- and ¹³C-nuclear magnetic shielding constants of compounds were calculated by employing the direct implementation of the GIAO method [2] at the B3LYP density functional and HF levels of the theory [3]. The geometry of each compound has been optimized using a 6-311G basis set. Nuclear shielding constants were also calculated by using 6-311G basis set. Theoretical values are compared to the experimental data.



1,3 R = a:CH₃; b: Et, c:Pr; d:Bn; e: CH₂C₆H₄Cl(*p*); f:Ph

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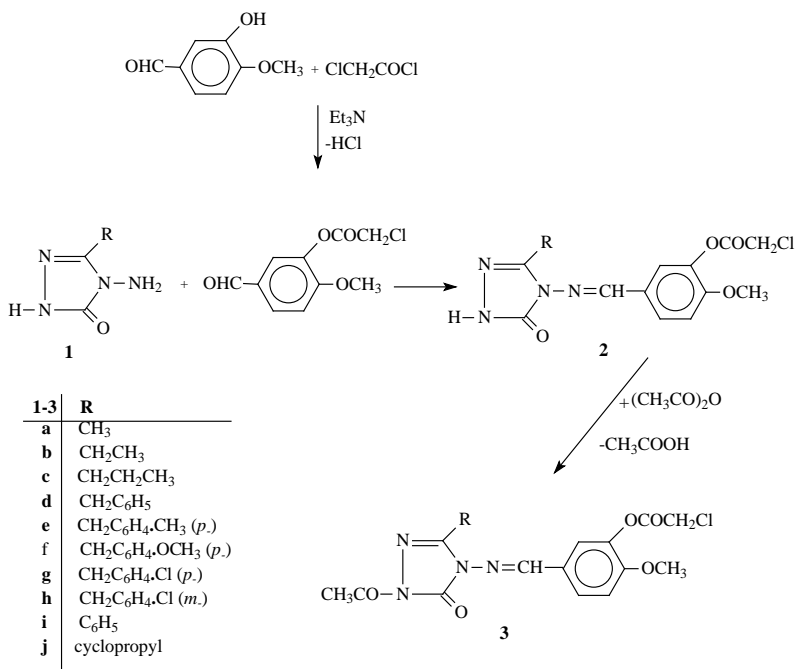
Acknowledgment: This study is supported by TUBITAK. Project Number: 108T984.

PP 68. **SYNTHESIS AND ANTIOXIDANT ACTIVITIES OF SOME NOVEL 1-ACETYL-3-ALKYL-4-(3-CHLOROACETOXY-4-METHOXYBENZYLIDENAMINO)-4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONES**

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1,2,4-Triazole derivatives have drawn considerable attention for the past few decades due to their diverse biological properties. Many 1,2,4-triazole derivatives are found to be potent antioxidant, anti-inflammatory, antimicrobial and antiviral agents. The identification of triazoles and determination of their antioxidant activities are of considerable interest because of the role they play in pharmacological actions. In this study, ten novel 1-acetyl-3-alkyl-4-(3-chloroacetoxy-4-methoxybenzylidenamino)-4,5-dihydro-1H-1,2,4-triazol-5-ones (**2**) having 4,5-dihydro-1H-1,2,4-triazol-5-one ring were synthesized by the reactions of 1-acetyl-3-alkyl-4-(3-chloroacetoxy-4-methoxybenzylidenamino)-4,5-dihydro-1H-1,2,4-triazol-5-ones which were synthesized from the reactions of 3-alkyl(aryl)-4-amino-4,5-dihydro-1H-1,2,4-triazol-5-ones (**1**) with 3-chloro-4-methoxybenzaldehyde and characterized by elemental analyses and IR, $^1\text{H-NMR}$, $^{13}\text{C-NMR}$ and UV spectral data. The starting compounds 3-alkyl-4-amino-4,5-dihydro-1H-1,2,4-triazol-5-ones (**1**) were prepared from the reactions of the corresponding ester ethoxycarbonylhydrazones with an aqueous solution of hydrazine hydrate. 3-Chloro-4-methoxybenzaldehyde was obtained from the reaction of 3-hydroxy-4-methoxybenzaldehyde with chloroacetyl chloride by using triethylamine. In addition, the synthesized new compounds were analyzed for their in vitro potential antioxidant activities in three different methods, including 1,1-diphenyl-2-picryl-hydrazyl free radical (DPPH $^{\cdot}$) scavenging, reducing activity by Fe^{+3} - Fe^{+2} transformation and ferrous metal (Fe^{+2}) chelating activities. Butylated hydroxytoluene (BHT) and α -tocopherol were used as reference antioxidant compounds.



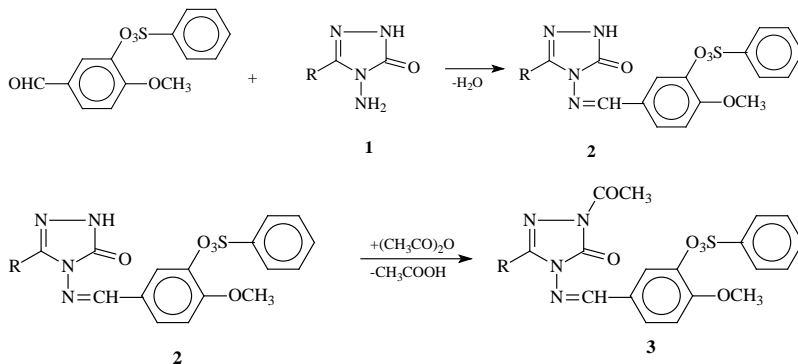
PP 69. **SYNTHESIS AND ANTIMICROBIAL ACTIVITIES OF SOME NEW 3-ALKYL(ARYL)-4-AMINO-4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONE DERIVATIVES**

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1,2,4-Triazole derivatives have drawn considerable attention for the past few decades due to their diverse biological properties. Many 1,2,4-triazole derivatives are found to be potent antioxidant, anti-inflammatory, antimicrobial and antiviral agents. The identification of triazoles and determination of their antimicrobial activities are of considerable interest because of the role they play in pharmacological actions.

This study was planned as two parts. The first part contains that synthesis of new compounds. In this section, seven new 3-alkyl(aryl)-4-(4-methoxy-3-phenylsulfonyloxybenzylidenamino)-4,5-dihydro-1H-1,2,4-triazol-5-ones (**2**) were synthesized from the reactions of 3-alkyl(aryl)-4-amino-4,5-dihydro-1H-1,2,4-triazol-5-ones (**1**) with 4-methoxy-3-phenylsulfonyloxybenzaldehyde, which was synthesized by the reaction of 3-hydroxy-4-methoxybenzaldehyde with benzenesulfonyl chloride by using triethylamine. Besides, the reactions of compounds **2** with acetic anhydride gave compounds (**3**) (Scheme 1). And then, the structures of the new compounds were characterized by using IR, ¹H-NMR, ¹³C-NMR spectra. Furthermore, UV spectrums of the new compounds were investigated and λ_{\max} and ϵ values were calculated.



Scheme 1.

In the second part of the study, it was investigated antimicrobial activity of the new

compounds by used "Agar well diffusion method". And then, the results were showed on a table. For this method, Ampicillin, Streptomycin and Fluconazole, were used as reference antibiotics. And all bacterial and yeast strains were obtained from the Hifzissihha Institute of Refik Saydam (Ankara, Turkey). At the end of the study, the compounds 2 and 3 were screened for their invitro antimicrobial activities. This test was aimed at the determination of in-vitro antimicrobial activities of these new compounds synthesized in the study to evaluate their nutraceutical and medicinal values.

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PP 70. **NEW BIODEGRADABLE POLYMERS BASED ON BIS-AZLACTONES**

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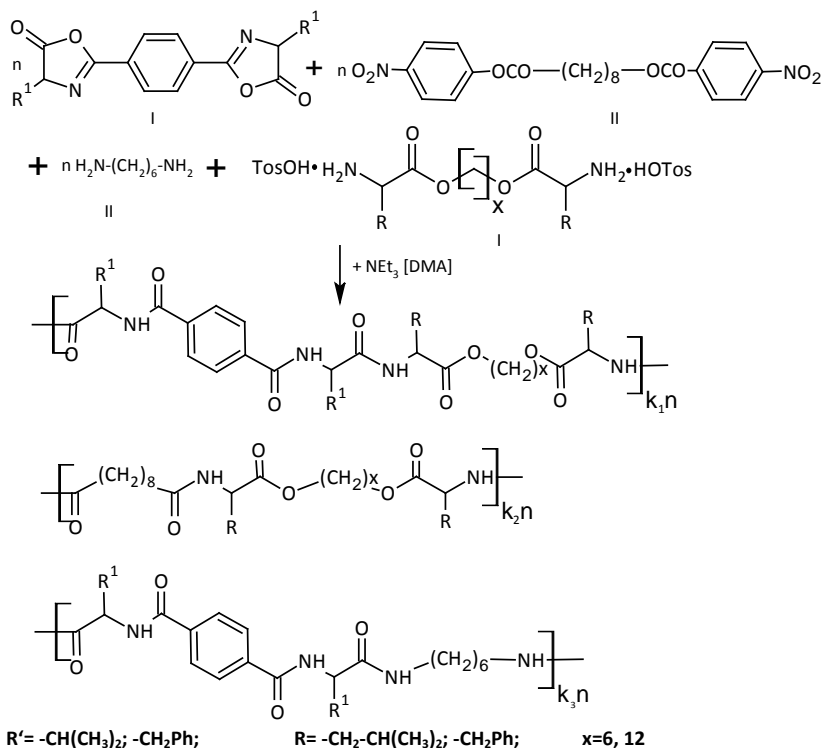
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The application of various therapeutical micro- and nano-containers has become one of the most important areas of modern medicine. These small drug-vehicles demonstrate a broad variety of useful properties like target drug delivery, intracellular transportation of drugs and penetration through blood-brain barrier (BBB), etc.

Reasonable requirements to the mentioned containers are to be highly biocompatible and to decompose and clean out from the body after fulfillment of the mission. Hence, the containers made of biodegradable polymers are of special interest. Amino acid based poly(ester amide)s (PEAs) obtained by polycondensation of active diesters of dicarboxylic acids (II) with di-*p*-toluenesulfonic acid salts of *bis*-(α -amino acid)-alkylene diesters (IV) [1], almost ideally meet the said biological requirements. The reported PEAs, however, are less suitable for preparing micro- and nanoparticle using a single oil-in-water (O/W) emulsion technology or precipitation method due to rather hydrophilic nature that leads to particles aggregation. To increase the PEAs hydrophobicity we decided to combine active diesters (II) with "cyclic active diesters" - *p*-phenylene-bis-oxazolinons - *bis*-azlactones (I) we used previously for synthesizing high-molecular-weight polyamides by interaction with alkylendiamines (III) [2,3]. The use of bis-azlactones as bis-electrophilic comonomers allows to incorporate hydrophobic N,N'-terephthaloyl-*bis*- α -amino acids fragments into the PEAs backbones [4]. The new hydrophobic PEAs were synthesized according to general Scheme.

The following polymers have been synthesized:

1. Homo-poly(ester amide)s by interaction of bis-azlactones (I) with diamine-diester (IV): $k_1 = 1$; $k_2 = k_3 = 0$;
2. Co-poly(ester amide)s by replacing a part of bis-azlactones (I) with active diester (II): $k_1/k_2 = 0.1/0.9$; $0.3/0.7$; $0.5/0.5$; $k_3 = 0$.
3. Co-poly(amide/ester amide)s by replacing a part of diamine-diester (IV) with alkylene diamines (III): $k_1/k_3 = 0.1/0.9$; $0.3/0.7$; $0.5/0.5$; $0.9/0.1$; $k_2 = 0$.



The reduced viscosity of the obtained polymers ranged from 0.1 to 1.4 dL/g depending on comonomers feed ratio. Most of the polymers obtained formed micro and nano-particles by cost-effective solvent evaporation (O/W emulsion technology) and precipitation methods, and are promising for the said biomedical applications.

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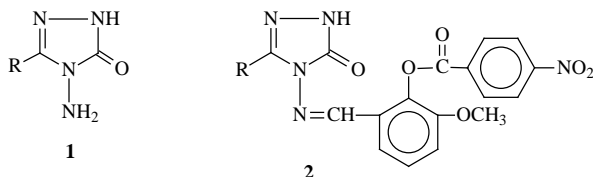
PP 71. **ANTIOXIDANT ACTIVITIES OF SOME 4-[2-(4-NITROBEZOXY)-3-METHOXY]-BENZYLIDENAMINO-4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONE DERIVATIVES**

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In the last decade, a great deal of research has been devoted to the study of different types of new antioxidant compounds, either synthesized or obtained from natural sources which may at least minimise the deleterious effects induced by reactive oxygen species (ROS). Exogenous chemicals and endogenous metabolic processes in human body or in food system might produce highly reactive free radicals, especially oxygen derived radicals, which are capable of oxidizing biomolecules by resulting in cell death and tissue damage. A large number of heterocyclic compounds, containing the 1,2,4-triazole ring, are associated with wide ranges of biological activities.

In the present study, nine 3-alkyl(aryl)-4-[2-(4-nitrobenzoxy)-3-methoxy]-benzyliden-amino-4,5-dihydro-1h-1,2,4-triazol-5-ones (**2**), which were synthesized by the reactions of **1** type compounds with 2-(4-nitrobenzoxy)-3-methoxybenzaldehyde, were obtained according to literature [1]. Then in-vitro antioxidant activities of **2** type compounds were investigated. The power antioxidant activity of tested compounds was determined by the ferric-reducing antioxidant (FRAP), 1,1-diphenyl-2-picrylhydrazyl (DPPH) assays and Fe^{2+} -metal chelating assay. Butylated hydroxytoluene (BHT), butylated hydroxyanisole (BHA) and α -tocopherol were used as reference antioxidant compounds. The investigation of antioxidant properties screening data revealed that all the tested compounds showed moderate activities. Future studies will be necessary to determine their possible role in mitigating the deleterious effect of ROS in different biological systems.



R=a) CH_3 ; b) CH_2CH_3 ; c) $\text{CH}_2\text{CH}_2\text{CH}_3$; d) $\text{CH}_2\text{C}_6\text{H}_5$; e) $\text{CH}_2\text{C}_6\text{H}_4.\text{CH}_3$ (*p*-); f) $\text{CH}_2\text{C}_6\text{H}_4.\text{OCH}_3$ (*p*-); g) $\text{CH}_2\text{C}_6\text{H}_4.\text{Cl}$ (*p*-); h) $\text{CH}_2\text{C}_6\text{H}_4.\text{Cl}$ (*m*-); i) $\text{CH}_2\text{C}_6\text{H}_4.\text{CH}_3$ (*p*-); j) C_6H_5

Reference

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PP 72. SPIROPYRANS ON THE BASE OF 2H-AZACHROMENE DERIVATIVES

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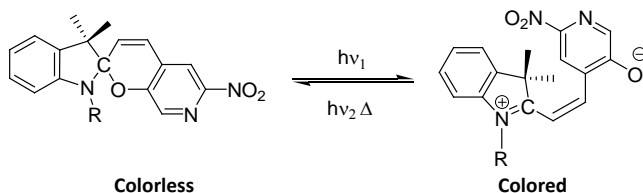
The keen interest in the photochromic compounds is due to their perspective wide practical use. The given compounds are characterized by such special properties, as high resolution, gaining the image directly at the moment of light exposure, change of the recorded information within a wide time range, rewriting or correcting the image by the impact of thermal or radial energy at one's choice, and gaining the negative or positive image.

Photochromic materials are used during the reflection of dynamic information, in swift optical treatment of optical and electronic signals, in the elements of the computer RAM, in micro-filming and micro-recording systems, printing industry where high resolution is of particular importance, optoelectronics, dosimetry, actinometry, optical switches, in automatic managing of light, etc.

Among the photochromic compounds, spiropyrans (spirochromenes) play a particular role due to their unique properties, such as high light sensitivity ($\sim 20 \text{ mJ/cm}^2$), high coloring velocity (10^{-7} sec), contrast, high resolution (at a molecular level), maximum value of two-photon absorption coefficient, etc.

Spiropyrans show their photochromic properties in liquid and solid solutions (polymer composites), as well as in crystal and amorphous states.

Two fragments of spirochromene - the chromene and indole (or benzthiazole, benzoxazole, benzoselenazole, etc.) are linked via spiro-carbon. By means of irradiation or thermally, C-O link is split and a colored form is originated.



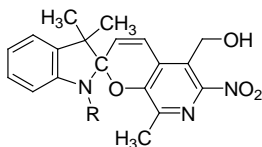
Even the slight changes in the fine structure of a spirochromene molecule are directly reflected on such of its peculiarities as light sensitivity, solubility, coloring and decoloring time, cyclicity, absorption maximum, etc. The compounds with particular properties are gained. For example, insertion of 7-azaindole in the molecule instead of indol resulted in the sharply increased velocity of inverse reaction [1], and in case

of 4-azaindole, the light sensitivity increased by one and a half [2].

Therefore, insertion of azachromene instead of a chromene fragment seemed interesting to us what we have accomplished on pyridoxal base (vitamin B₆ group) [3].

The gained compound is characterized by photochromy close to the room temperature. Due to the high velocity of inverse reaction, no visualization of the colored form is possible without cooling.

The insertion of a nitro-group in the only free position of pyridine core favorable for photochromic transformations has made it possible to observe the photochromic transformations at the room temperature.



At present, optical, thermodynamic and kinetic properties are studied through the preliminary data. 2H-azachromene photochromic compounds seem quite perspective. The existence of a methyl group in 8-state must help the chemical location of the colored form, as in the given position the electronic-acceptor substitutes reduce the stability [4].

The existence of oximethyl in 5-position is also interesting in respect of forming the nano-structures. At last, the use of 2-methyl-3-hydroxyl-4-formyl-5-oximethyl-6-nitropyridine creates a perspective to synthesize new compounds with unique photochromic properties.

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PP 73. **SYNTHESIS OF ANALOGUES OF NATURAL BIOLOGICALLY ACTIVE
SUBSTANCES AND OBTAINING OF SAFE PREPARATIONS**

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Wide application of agricultural preparations, including pesticides gives an opportunity to protect third part of harvest from pests, weeds and diseases. Now among world assortment of pesticides is more than one hundred active initials, 700 from them are used more often. Ten thousand various preparations are prepared on the basis of these active compounds or by combination of these initials. Besides, approximately 200000 new chemical substances test on potential activity of pesticides per year.

Elaboration of accessible methods for obtaining initial products and usage of natural components, which are specific, highly effective in small doses and ecologically safe is an important stage in synthesis of new organic compounds with valuable practical properties. Possible negative influence on environment and public health must be considered, just as research - monitoring of estimation of existing risks [1]. In creation of such preparations the synthesis of compounds that are analogues of natural biologically active substances is actual problem. Getting environmentally friendly products by using a number of preparations prepared on the basis of local resources is possible.

The pheromone sex traps are irreplaceable for prognosis of the pests spread, also it can be used for fighting against pests, so-called „Male Vacuum” method. This method is quite effective in case of medium dispersion of pests. In case of high tightness dispersion can be applied compositional preparations containing natural compounds with low concentration of pyrethroids. Methods of synthesis of sex pheromones of the basic pests of gardening of the Georgian agriculture are developed: pheromone of Grape Worm (*Lobesia botrana* Shiff.) - E,Z-7,9-dodecadiene-1-il-acetate; apple fruit-crow (*Laspeyza pomonella* L.) - E,E-8,10-dodecadienole; the major component of peach pest (*Grapholita molesta* Bush.) sex pheromone - Z-8-dodecene-1-il-acetate; the major component plus minor component (6-7%) of plum pest (*Gapholita funebrana* Ts.) sex pheromone - E-8-dodecene -1-il-acetate.

The multistage methods of fine organic synthesis and condensation of the block-syntons for synthesis of active initials of these sex pheromones are used. It makes these preparations commercially available. [2].

The new methods for production of sex pheromones on the basis of natural products are elaborated. Usually, sex pheromone of apple pest (*Aspidiotus Californicus*)

is synthesized in 7 stages, while it is possible to synthesize this propionate in two stages from natural product –Geraniol. The synthesis of pheromone component (*cis*-verbenol) of forest pest (*Ips. Typographus* L.) is possible from α -pinene (natural product) and et.

Pheromones were widely used in Georgia. Nowadays interest in pheromone sex traps again is actual, because they are environmentally friendly. It gives an opportunity to obtain harmless agricultural products. Use of sex traps decreases the volume of chemical spraying.

It is necessary to note that nowadays possibilities of synthesis have significantly changed. Several block-syntons have appeared on the market of reagents which sharply reduce the number of stages and laboriousness of synthesis. It is possible to receive final products in two-three stages by selection and application of corresponding block-syntons.

Important works are carried out in synthesis of juvenoids, the analogs of the hormone which causes the changing of the chitin in insects. Well known juvenoid - fenoxycarb is received not by multi-stage synthesis, but by condensation of two block-syntons [3].

Application of block-syntons, receiving of which is possible by extraction from plants or their further modification, was very successful in case of pyrethroid compounds. Pyrethroids are synthetic derivatives of chrysanthemic acid, extracted from camomile (*Chrysanthemum Cinerariaefolium*). These natural insecticides reveal pesticide affect towards insects [4-6]. By structural modification of natural pyrethrins - chemical modification of chrysanthemic acid and condensation with alcoholic fragments (basically compounds with cyclic structure – derivatives of cyclopropane, cyclopentadiol, benzyl and furan rings and others) the entire class of synthesized insecticides - pyrethroids are obtained.

The condensation of various plant phenol compounds with chrysanthemic acid is carried out; it gives an opportunity to receive compounds not only with pesticide activities. For example, several adduct of chrysanthemic acid with juglone and its derivatives are obtained. Use of extracts from plant remains is the new direction of our investigation. Compounds - 4 membercyclic and open chain allocimene, with processing of α -pinene, which is obtained from the turpentine extracted from the residue of softwood are received. Their functioning makes possible to connect alkaloids obtained from residues of platyphyllin producing from Groundsel (*Senecio platyphylloides* Somm.), also interaction of plant phenolic compounds with chrysanthemic acid derivatives. Thus, it is possible to obtain active compounds for fighting against agricultural pests and diseases by the interaction of plant biological active fragments. Also separation of biologically active substances from Georgian endemic plants, their description and use for obtaining effective medical means is interesting.

Now in Georgia the repellents are not used for plant protection, though there was positive experience in use of insecticide-repellents. The joint tests of non-drying glue belt and repellents against creeping and flying pests have been conducted. It is possible to produce repellent components from local chemical raw materials and residues, *i.e.* obtaining methylcyclopentanones from cyclohexanol. Obtaining dimethylphthalate from naphthalene separated from the coke-chemical residues is possible as well. Dimethylphthalates and their amino-derivatives have effective repellent properties. Moreover, the repellent compositions were elaborated from the natural components: eugenol, isoeugenol, citronellol, geraniol, turpentine and etc.

Application of compounds extracted from natural plants increases the raw material base for production of environmentally friendly biologically active means.

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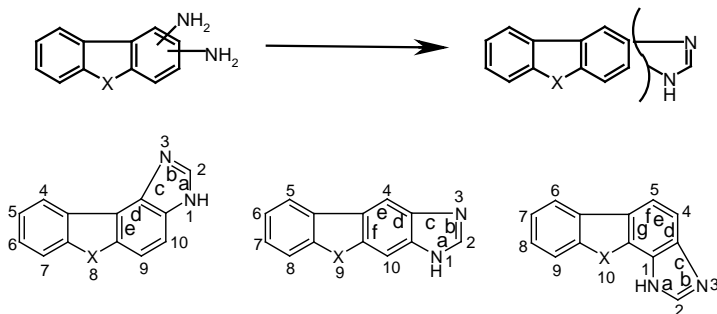
PP 74. **NEW TETRACYCLIC HETEROCYCLIC SYSTEMS, CONTAINING
BENZIMIDAZOLE AND BENZOTHIOPHENE/BENZOFURANE AND
THEIR DERIVATIVES**

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One of the most important goals of modern organic chemistry is synthesis of effective biologically active substances. Following working at the condensed heterocyclic systems, we've created on the one hand benzimidazol, and on the other hand tetracyclic systems, containing benzothiophene/benzofurane and their derivatives. Our choice was made, according to the high biological activity of the substances, containing benzothiophene/benzophurane.

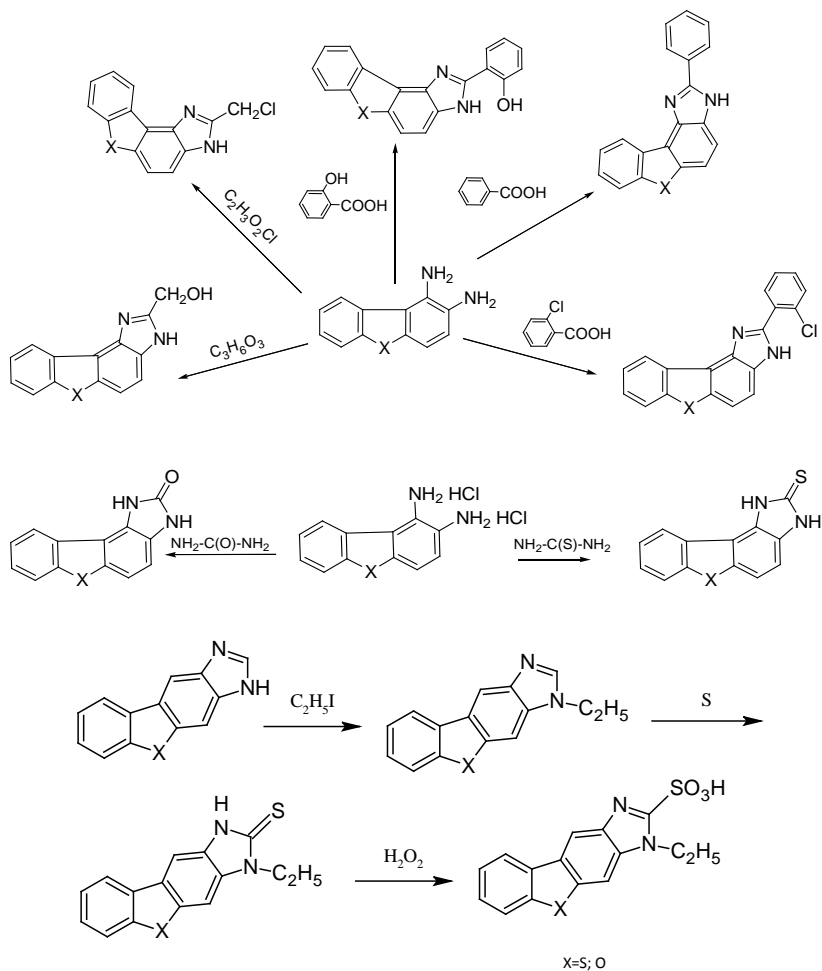
Initially, we had taken diamines of all possible constructions of dibenzothiophene and debenzophurane. By cyclisation of this substances in conditions of Phillips modified reaction we got responsive benzothiophene/benzophurane [1]



where X= S; O

On the base of created benzimidazoles had been synthesised derivatives with possible biological activity. Derivative products were created as during the process of cyclisation, also from the tetracyclic systems. [2-3]

All substances are characterised with the help of UV, IR and BMR spectroscopy and are sent for the biological screening.



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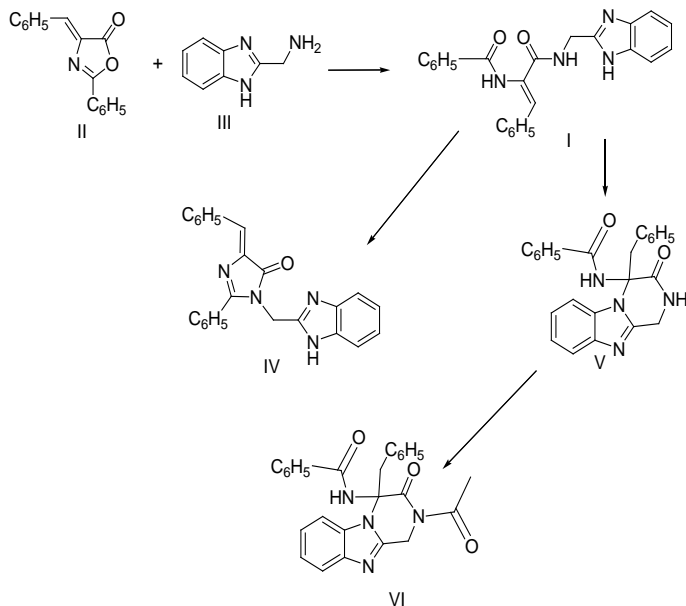
PP 75. **NEW METHOD OF SYNTHESIS OF 4-BENZYL-3-OXO-4-PHENYL
CARBOXAMIDE-1,2,3,4-TETRAHYDRO[4,5]IMIDAZO[1,2A]PIRAZIN**

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Derivatives of α,β -dehydroamino acids have been widely used in organic synthesis. Being polyfunctional substances, these compounds interact in several reactions by the formation of various heterocyclic systems. Derivatives of α,β -dehydroamino acids play important role in the synthesis of non-protein amino acids, as well as physiologically active compounds.

Present communication is devoted to the study of intermolecular cyclization reactions of 2-[(Z)-2-phenyl-1-phenyl carboxamide-1-ethenyl]-1H-benzo[d]imidazole (I) under various conditions.



Synthesis of the compound (I) was carried out by the reaction of 2-phenyl-4-benzylidene-5-oxazolone (II) with 1H-benzo[d]imidazole-2-yletanamine (III) in chloroform at room temperature. Having a goal to synthesize 1-(1H-benzo[d]imidazole-2-yl)-2-phenyl-4-(Z)-1-phenylethyliden]-4,5-dihydro-1H-5-imidazolone (IV) compound,

the interaction of compound I with HMDS (1,1,1,3,3,3-hexamethyldisilazane) was carried out by boiling about 2 hours in DMF medium. As a result, the compound IV was obtained with 42% yield.

During the boiling of the compound I in dioxane in the presence of potassium carbonate for 15 h resulted a mixture, that contained 4-benzyl-3-oxo-4-phenyl carboxamide-1,2,3,4- tetrahydro[4,5]imidazo[1,2a]pirazin (V) (63%) and compound IV (21%). Conducting the same reaction in DMF medium leads to the formation of compound V. The acylation of compound V can be easily achieved by its boiling in acetylic acid medium.

PP 76. **SYNTHESIS OF SUBSTITUTED ACYLHYDRAZINO-
[1,3,5]-TRIAZINES**

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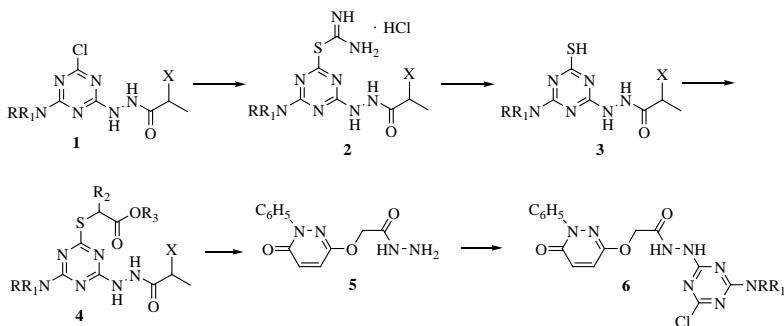
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Thanks to the diversity of useful properties, hydrazine derivatives are widely used in various fields of science and technology; many representatives of the several compounds are indispensable as jet fuel, medicines and chemical means of plant protection [1-3].

Continuing our research in this direction, we had previously synthesized a number of acylhydrazino-1,3,5-triazine derivatives by various methods [4-8], among which the compound 2-chloro-4-sec-buthylamino-6-(2-propionylhydrazino)-1,3,5-triazine with growth regulatory activity was discovered [8]. Taking into account of the high activity of this preparation, it was interesting to synthesize new derivatives of this series in terms of search for new plant growth regulators.

The reaction of 2,4-dichloro-6-alkyl(dialkyl) amino-1,3,5-triazines with propionyl hydrazide in the presence of potassium carbonate in water-dioxane mixture a number of new 2-chloro-4-alkyl(dialkyl)amino-6-(2-propionylhydrazino)-1,3,5-triazine derivatives were obtained (**1**, **X=H**).



In a series of arylalkancarboxylic acid derivatives there are well-known compounds with herbicidal activity. With the purpose to obtain arylalkancarboxylic acid hydrazides condensed with 1,3,5-triazine cycle, 2-aryloxy(arylamino)-propionic acid esters were converted into the corresponding hydrazides, and then by interaction of these hydrazides with 2,4-dichloro-6-alkyl (dialkyl)-amino-1,3,5-triazines in the

presence of potassium carbonate the 2-chloro-4-alkyl(dialkyl-amino)-6-acylhydrazino-1,3,5-triazines (**1**, X=OAr, NHAr) were obtained.

In order to obtain water soluble salts the 2-propionyl(1-substituted propionyl) hydrazino-1,3,5-triazines (**1**) were converted into thiourea salts (**2**) in acetone in the presence of catalytic amounts of hydrochloric acid.

In search of new high-performance pesticides, as well as considering the high physiological activity of triazinylthiocarbonic acids, we have developed a synthesis of new triazinylthiocarbonic acids in combination with 2-propionylhydrazinyl fragment. For this purpose, by decomposition of 2-propionylhydrazino-1,3,5-triazine thiouronium salts the 2-mercapto-4-alkyl(dialkyl)-amino-6-(2-propionyl)-hydrazino-1,3,5-triazines were obtained (**3**). The reaction of compounds **3** with halogencarbonic acids in the presence of sodium iodide leads to 2-alkyl-(dialkyl)amino-4-(2-propionyl)hydrazino-1,3,5-triazinyl-6-thioalkancarbonic acids (**4b** R₃=H) formation. The latters, in order to obtain water soluble products, were converted into sodium salts.

By the reaction of 2-mercapto-4-alkyl(dialkyl)-6-(2-propionyl)hydrazino-1,3,5-triazines with halogencarbonic acids in acetone in the presence of potassium hydroxide esters (**4**, R₃=Alk) were synthesized.

Further syntheses were carried out on the base of (6-oxo-1-phenyl-1,6-dihydropyridazine-3-yloxy) acetic acid hydrazide (**5**), which with 2,4-dichloro-6-alkyl(dialkyl)amino-1,3,5-triazines in water-dioxane mixture in the presence of potassium carbonate forms 2-chloro-4-alkyl(dialkyl)amino-6-[2-(1-phenyl-6-oxo-1,6-dihydropyridazine-3-yloxy)acetyl]-hydrazino-1,3,5-triazines (**6**). In the case of synthesized compounds 1-4 the changes in ¹H and ¹³C NMR spectra depending on temperature were detected. It is proved that in the molecules of these compounds a process of hindered internal rotation around the exocyclic C-N bond is occurred.

The results of biological screening showed that the substances of new synthesized series do not possess appreciable herbicidal or fungicidal properties, but exhibit expressed growth stimulant activity, which in some cases approach the activity of a well-known and widely used preparation heteroauxin.

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PP 77. **THE CHEMICAL STRUCTURE OF TRITERPENE GLYCOSIDES FROM
AKEBIA QUINATA INTRODUCED IN GEORGIA**

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The triterpene glycosides derivatives of hederagenin and oleanolic acid were isolated from the leaves *Akebia quinata* introduced in Georgia. The structures of the isolated compounds were established using modern research methods. These glycosides were identified as: 3-O-(α -L-Rhap-(1 \rightarrow 2)- α -L-Arap), 28-O-(α -L-Rhap-(1 \rightarrow 4)- β -D-Glcp-(1 \rightarrow 6)- β -D-Glcp) oleanolic acid (Hederacolchiside B), 3-O-(α -L-Rhap-(1 \rightarrow 2)- α -L-Arap), 28-O-(α -L-Rhap-(1 \rightarrow 4)- β -D-Glcp-(1 \rightarrow 6)- β -D-Glcp) hederagenin (Hederacolchiside C) [1] and 3-O- α -L-Rhap-(1 \rightarrow 2)- α -L-Arap hederagenin or α -hederine [2].

Abovementioned glycosides are isolated from leaves of *Akebia quinata* Decne.

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PP 78. **FOR STUDY OF TRITERPENE SAPONINES FROM PHYTOLACCA AMERICANA**

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Phytolacca americana L. (Phytolaccaceae), is the native to the south of mainland China and the eastern United States, respectively. Dried roots are used as a traditional herbal medicine and a folk medicine in China and are called "Shang-Lu" and "Chi-Xu Shang-Lu", respectively which are used for treatment of tumors, edema, bronchitis and abscesses (1,2). *Phytolacca americana* is a toxic plant in the United States and causes vomiting when the fruits, leaves and roots are consumed (3). *Phytolacca americana* is widely spread in Georgia and is used by the autochthons against different diseases (4).

There are only few works on phytochemical investigation of fruits of this plant. The purpose of our work was the investigation of phytochemical constituents of fruits of *Phytolacca americana*, structure determination of isolated pure compounds, as well as the elucidation of chemical structure-activity relationships.

On the base of various chromatographic techniques, more than ten known triterpene compounds were isolated from the fruits of *Phytolacca americana*. Their structures have been established on the base of MS, 1D and 2D NMR spectral evidences. Glycoside H has been detected previously in cell culture of *Phytolacca acinosa* (5). Glycoside I – 3-O-(β -D-xylopyranosyl-(1 \rightarrow 3)- β -D-galactopyranosyl-(1 \rightarrow 3)- β -D-xylopyranosyl)-28-O- β -D-glycopyranosyl-phytolaccagenin, which has been identified for the first time in fruits of *Phytolacca americana*.

Were studied inhibiting concentration, antioxidant activity and cytotoxicity of the crude extracts and of enriched fractions of the different parts (roots, leaves, fruits) of *Phytolacca americana*.

Thus, is isolated a new organic compound from the fruits of *Ph. americana*. Was studied biological activity of the crude extracts and of the enriched fractions.

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PP 79. **COORDINATION COMPOUNDS WITH TRIARYL- AND
DIARYL(ALKYL)ARSINOXIDE**

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One of the main properties of the oxides of tertiary arsines in the formation of coordination compounds with the salts of transition metals. It must be mentioned, that compounds which contain arsenyle group As-O are widely used as the best extragents for different metals.

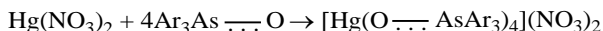
The extragent $R_3As=O$ (where R is organic radical) form complexes by electron-acceptor type mechanism. Oxygen atom acts as donor of electrons, the vacant orbitals of metal are acceptors.

We have studied the complex formation ability of mercury (II) salts with triaryl and diaryl (alkyl) arsines.

For obtaining of oxides of tertiary arsines, the reactions of oxidation of these arsines with hydrogen peroxide was used:



This compound reacts only with Hg(II) nitrate. By mixing the solution of these compounds the reaction proceeds nearly quantitatively, and the constitution of the product of addition doesn't depend on the concentrations of these solutions:



The constitution of synthesized compound was determined by chemical and physical-chemical methods.

PP 80. **ANTIMICROBIAL ACTIVITY OF NEW CATIONIC PORPHYRINS OF SYNTHETIC AND NATURAL ORIGIN**

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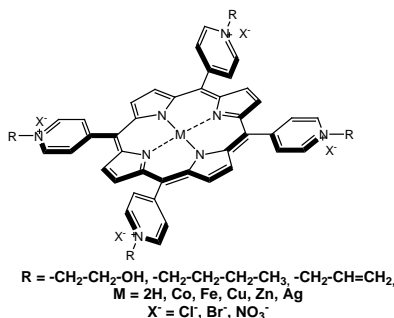
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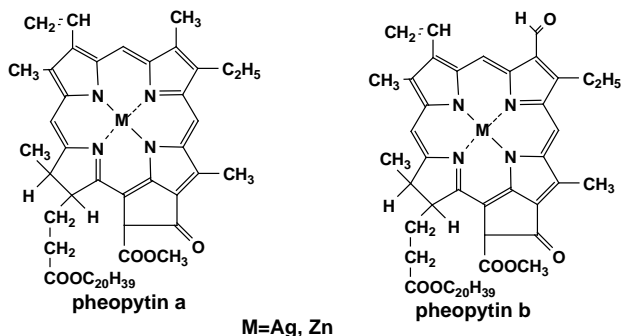
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Currently photodynamic inactivation (FDI) of microorganisms by photosensitizers is one of the most promising directions for the destruction of antibiotic resistance microorganisms. Photosensitizers (PS) are the natural or synthetic origin dyes, mainly porphyrins. The concept of photodynamic inactivation follows the same principles as for the photodynamic therapy (PDT) of tumors: non-toxic dyes, porphyrins, can be localized in/on cells, activated by light, generate singlet oxygen and free radicals that are toxic to target cells (microorganisms). PDI has been successfully used against Gram (+) microorganisms, but most of the PS on Gram (-) bacteria acts weakly. The purpose of this study was the synthesis of new porphyrins and metalloporphyrins, as well as their extraction and separation from a natural source (from chlorophyll of nettle) and their testing against Gram (+) and Gram (-) microorganisms.

We have synthesized new cationic meso-tetra-pyridylporphyrins and metalloporphyrins with different functional groups (hydroxyethyl, butyl, allyl, methallyl) and metals (cobalt, iron, copper, zinc, silver and other).



From the nettle have also been extracted and separated pheophytin (a+b) and pheophytin (a) and have synthesized their Ag-and Zn-metalloporphyrins.



It was found that in the dark (cytotoxic) mode, the most highly efficiency against microorganisms showed Ag-metalloporphyrins of both types of porphyrins (synthetic and natural). It was determined that in photodynamic mode the most highly efficiency for destruction of microorganisms has a new cationic metalloporphyrin Zn-TBut₄PyP: 0.4-0.75 mkg/ml for Gram (+) and about 2 mkg/ml for Gram (-) microorganisms.

The purpose of this study was synthesis of porphyrins and metalloporphyrins, as well as extracted of porphyrins from chlorophyll of nettle and separated pheophytin (a+b) and pheophytin (a) and synthesis of their Ag- and Zn-metalloporphyrins) and testing both types of porphyrins against microorganisms. It was found that in dark mode, the most highly efficiency against microorganisms showed Ag-metalloporphyrins of both types of porphyrins. It was determined that in photodynamic mode the most highly efficiency for destruction of microorganisms has a cationic metalloporphyrin Zn-TBut₄PyP: 0.4-0.75 mkg/ml for Gram (+) and about 2 mkg/ml for Gram (-) microorganisms.

PP 81. **STUDY OF THERMAL STABILITY OF
POLYNAFTOYLENBENZIMIDAZOLES**

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Nowadays the problem of preparation of thermally stable polymers is topical theoretically as well as practically. Mentioned materials are widely used in various fields of technics. From this viewpoint, polynaftoilenbenzimidazoles (PNBI) – thermally stabile, frost – and heat-proof and radiation – resistant polymers, which have a wide spectrum of the use including radioelectronics, have attracted considerable attention [1].

Considering the integral curves of dynamic thermogravimetric analysis, the difference was revealed between the polymers, prepared by various methods and containing the fragments of naftoilenbenzimidazole in macromolecules of PNBI in different amounts: prepared by temperature elevation in stages, soluble in sulphuric acid, prepared at isothermal dehydration at 400 °C and non-soluble in sulphuric acid and prepared by one-stage high-temperature polycondensation in polyphosphoric acid [2]. Dynamic thermogravimetric analysis was carried out at T=100-900°C in argon atmosphere at electric thermal balance B-60 of "Seteram" firm by temperature elevation rate 5° per minute; Sample weight comprised 20 mg. In parallel, chromatographic analysis of gaseous products evolved after a thermal destruction was performed at the chromatograph LKHM-8MD.

As is seen in fig.1, a destruction of PNBI, prepared by one-stage polycondensation, only at the temperature of 525-550 °C. CO₂, H₂, and CH₄, are main destruction products. On thermogravimetric curves of the polymers with different rings, soluble in sulphuric acid, two sections are observed corresponding to the mass loss of initial samples. At first section (200-500 °C) the mass loss varies along with a degree of cyclization of the polymers under study. A steam is the sole volatile product, recorded by gas chromatography. Second section (T>500 °C) is characterized by more intensive mass reduction. In this case CO₂, H₂, and CH₄, are registered gaseous products of destruction. Differential curves of these products are similar regardless of their cyclization degree. Along with the correlation between the position of main temperature maxima, as well as a quantitative correspondence of gaseous products, formed at a common stage of destruction, were observed. Since the character of high-temperature destruction processes for the samples at T>525 °C is characterized by similar regularities, it may be considered that at first section of thermogravimetric curves of the polymers with various rings the mass loss is, mainly, due to the processes of intramolecular polycyclodehydration. A different

picture is observed for the polymers, prepared at 400°C. In this case an intensive decrease of polymer mass begins at relatively low temperature, ~ 450°C. Along with it, at this temperature an evolution of gaseous products of destruction – CO and CO₂ is recorded, pointing clearly to the existence of the fragments of low thermal stability in polymers.

Thermal study of the polymers, prepared by various regimes, in isothermal as well as in dynamic conditions of temperature elevation has shown that in PNBI, prepared by stage method, a cyclization degree near to 100% may be attained which is due to stage regime of temperature elevation. PNBI, prepared in these conditions, hold the solubility in sulphuric acid. And in their C¹³ nuclear magnetic resonance spectra, the signals characterized a carbon nuclei of carbonates of the fragments of (o-aminophenyl)naphthalimide, are practically absent. This fact is indicative of the attainment of such degree of polymer cyclization, when the possibility of the presence of the fragments of (o-aminophenyl)naphthalimide in PNBI macromolecules is less than a sensitivity of practically used method.

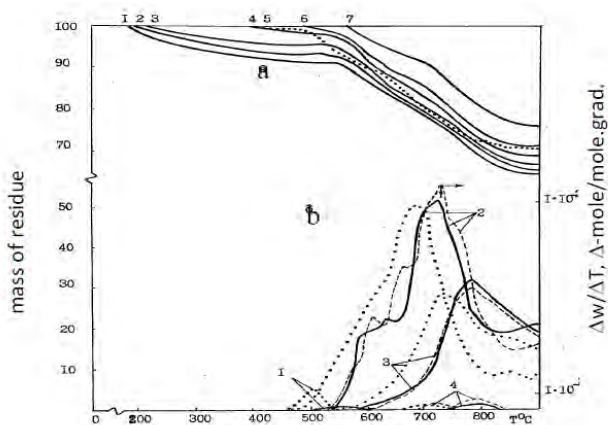


Fig.1 Curves of dynamic thermogravimetric analysis of polymers (PNBI) prepared at isothermal polycyclization ($T_{\text{reaction}}^{\circ}\text{C}$ 1-150, 2-220, 3-240 4-300, 5-400); 6 – by in stages method of temperature elevation, $T_{\text{max}} = 400^{\circ}\text{C}$; 7 – by one stage high-temperature polycondensation in polyphosphoric acid.

b. differential curves of gaz evolution in polymers, prepared by ysothermal polycyclization and by one-stage polycondensation in polyphosphoric acid (1 - CO₂, 2 - CO, 3 - H₂, 4 - CH₄).

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PP 82. **HETEROCYCLIC COMPOUNDS AS CARDIOVASCULAR DRUGS
ACCORDING TO THE OREX EXPERT SYSTEM DATA: STATISTICAL
ANALYSIS**

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Heterocyclic compounds are widely used as cardiovascular drugs with different properties and mechanisms of action.

With aim to optimize a search of new preparations, we are used Expert System OREX for the statistical analysis of data about medicinal preparations both in the arsenal of physicians and in different clinical trials stages.

The OREX Expert System has been elaborated in the Latvian Institute of Organic Synthesis for the investigation of structure–activity relationships (1, 2). It deals with descriptors (which approximately are structure fragments), which statistically characterize the compound biological activity.

The system of programs can be used for: Analysis of structural features of various activities; estimation of statistics for new compounds descriptors; statistical analysis of data bases; structural search; search by analogy; comparison of different structures to detect common features; prediction of biological activity of novel compounds; purposeful design of novel active compounds.

Every OREX user can create his own Database, Activity list and Descriptors and work within obtained Model.

We use two main Models differing in Database and Activity list, but having the same descriptors.

Database I contains 9,259 compounds under clinical trials till 1995 and drugs and the Database II contains 7,107 biologically active compounds, synthesized in 1990-2000.

In this work we analyzed the use of different heterocycles in the design of compounds with some cardiovascular activity, namely, antiarrhythmic, cardiostimular, and antianginal, which are included in these Databases.

The Database I contains 318 compounds possessing antiarrhythmic activity from which 196 have heterocycles in their structures, 232 cardiostimulants with 166 structures containing heterocycles and 194 antianginal compounds with 140 structures containing heterocycles. They are noncondensed or condensed heterocycles with different set of hetero atoms.

The similar distribution in the data base II is as follows: antiarrhythmic - 77 compounds with heterocycles from total 107, cardiostimular – 107 compounds containing heterocycles from total 133 and antianginal – 127 compounds with heterocycles from total 149.

The features of activities describing heterocyclic structures were found by means of OREX system and a statistical analysis was also performed.

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PP 83. **STRUCTURAL VARIETY OF THE REACTION PRODUCTS DURING
THE SYNTHESIS OF PURINE, 1,3-DIAZEPINE, PYRIMIDINE
CONTAINING HETEROCYCLES**

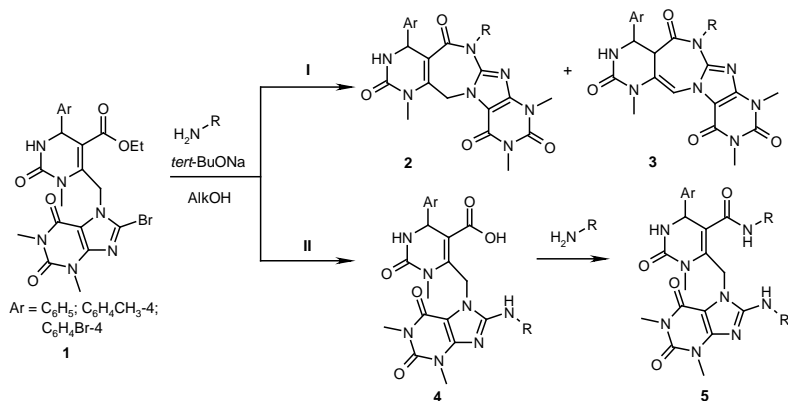
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Since both purine and pyrimidine oxo-derivatives play a crucial role among heterocyclic compounds that widely occur in living organisms [1-2], the aim of the presented study was to combine partially hydrogenated 2-oxypyrimidine cycle with a natural purine alkaloid theophylline within one molecule. Such an approach would suggest an increase in the resulting purinopyrimidines' biological activity.

The synthesis of annelated polyheterostructures **2**, that simultaneously contain molecular fragments of purine, 1,3-diazepine, pyrimidine was conducted through the stage of intramolecular cyclisation of C8-amino substituted purinopyrimidines **1**. Heating **1** in lower alcohols in the presence of catalytic amounts of *tert*-BuONa for 6h provides the formation of novel tertacyclic aza-heterosystem **2** in 79-63% yield. Quite unexpectedly, it was determined that 2*H*-pyrimido[5',4':5,6][1,3]diazepino[2,1-*f*]purines **2** undergo the double-bond rearrangement due to the mobility of the methylene group protons forming 2,4,11-trimethyl-8-aryl-6-substituted-8,9-dihydro-2*H*-pyrimido[5',4':5,6][1,3]diazepino[2,1-*f*]purine-1,3,7,10(4*H*, 6*H*,7*aH*, 11*H*) -tetrones **3**.



The formation of 1,2,3,4-tetrahydro-1-methyl-2-oxo-4-aryl-6-[[1,2,3,6-tetrahydro-1,3-dimethyl-2,6-dioxo-8-substituted-7*H*-purin-7-yl]methyl]-5-pyrimidinecarboxylic acid **4** with the yield of 39% occurred as the analogous reaction was prolonged for 12h. The newly formed carboxy group reacted with the excess of the amine forming 6-[[1,3-dimethyl-2,6-dioxo-8-substituted-1,2,3,6-tetrahydro-7*H*-purin-7-yl]methyl]-1-methyl-2-oxo-4-aryl-*N*-substituted-1,2,3,4-tetrahydropyrimidine-5-carboxamides of **5** type.

Thus, the reactivity of the heterocyclic systems that simultaneously contain purinopyrimidine cores has been studied. Structural characteristics of the obtained products have been proved with the ^1H , ^{13}C NMR as well as X-ray diffraction study data analysis.

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PP 84. **AMINOARYLINDOLES FOR RECORDING OF RELIEF PHASED AND
AMPLITUDE PHASED HOLOGRAMS**

**I. Chikvaidze, Sh. Samsoniya, N. Lekishvili, T. Tsitskishvili, N. Megrelishvili,
A. Gilels**

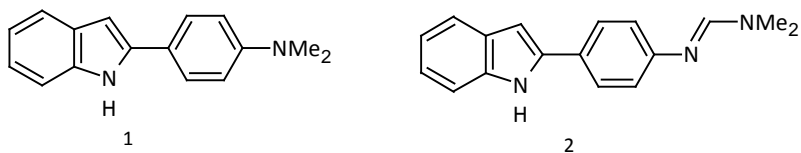
Iv.Javakhishvili Tbilisi State University, Georgia
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We have developed some new light sensitive holographic compositions to create efficient relief phased and amplitude phased holograms based on the charge transfer complexes (CTC) consisting of indole aminoaryl derivative (Scheme) as a donor unit and tetrabromomethane as an acceptor unit on the PMMA or polyvinylacetate (PVA) bearer ($d=20+70\text{ }\mu\text{m}$).

The difference between the mechanisms of photochemical processes induced by the irradiation from the absorption region of the sensitizing dye (cationic orange) and CTC, in the layer, serves as a basis of the holographic record for the above mentioned systems. The holographic record is a *two step* process. The *first* one involves the hologram formation under laser irradiation from the absorption region of the dye (argon laser, $\lambda=480\text{ nm}$). The formed hologram fixation with the simultaneous intensification thermally, under ammonia-stream or irradiation from the absorption region of CTC is taken place on the second stage.

The dependence of diffraction efficiency (DE) and resolution capability of holographic grill (grid) on holographic blend composition has been studied. It was also investigated the effect of chemical structure and rigidity of macro-chains of the carrier polymer on sensitizing time and fixation conditions of the formed holograms. The layer based on PVA had higher sensitivity. This fact could be explained by the lower oxygen permeability of PVA compared to PMMA what leads to reduction of the probability of dye sensitizing.

The compositions containing indole derivatives (1) and (2) have demonstrated the best holographic sensitivity, diffraction efficiency ($\approx 60\%$), resolution capability ($\geq 1000\text{ nm}^{-1}$). The stable relief phased holograms have been obtained. They can be stored under light for a relatively long time.



Scheme

Considering the importance of development of media for preparation of stable amplitude phased holograms, it seems to be obvious, that further research in the field of synthesis and investigation of light sensitive indole derivatives which do not contain easily oxidative amino groups are of expedience.

Use of holographic compositions of flexible polymeric carrier makes it possible to extend the assortment and the functional capability of the production of wide applications based on holograms. Such holograms have less weight and higher impact resistance as well as lower cost compared to those based on the glass carrier.

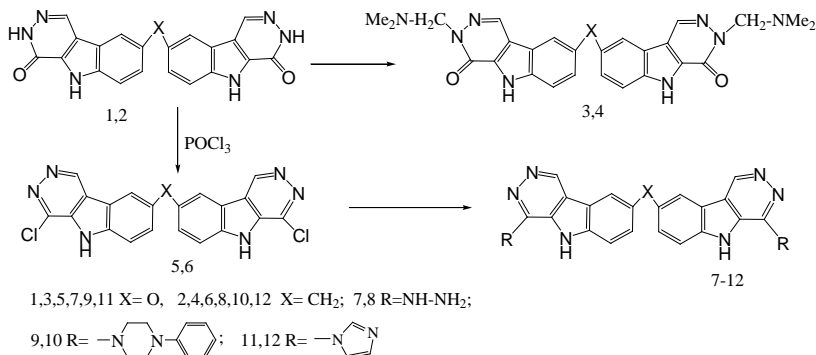
PP 85. NEW DERIVATIVES OF BISINDOLES AND BISPYRIDAZINO INDOLES

Sh. Samsoniya, N. Targamadze, I. Chikvaidze, N. Samsonia,
N. Ovsyannikova, N. Narimanidze

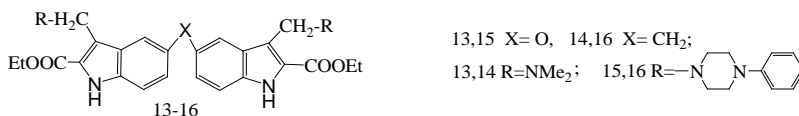
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From scientific and practical point of view the presence of two heterocyclic fragments in one molecule is very interesting. During the last 30 years on the department of organic chemistry of TSU the systems containing two and more heterocyclic fragments were created, among them bisanalogues of pyridazinoindoles – bistricyclis systems – on the basis of non-condensed bisindoles, also condensed pentacyclic azomatic system – bispyridazinopyroloindoles.

The best way of obtaining of indole-containing new structure is the functionalization of the derivatives of indole by active organic fragments. For this aim 5 and 6 compounds carry out nucleofilar substitute from Cl atoms.



By aminoalkylation of lactamic NH groups of bispyridazinoindoles (1, 2) Mannikh bases are easily formed 3, 4, which analogues 13, 14 are obtained by aminoalkylation of bisindoles. It must be underlined, that bisindoles in the same condition easily form corresponding derivatives with phenylpyperazine 15, 16, but bispyridazino indoles (1, 2) don't react with phenylpyperazine.



The conditions of synthesis and biological activity of 5-16 compounds and their pyroloindolic analogues are discussed in this report.

PP 86. **OBTAINING OF SOME LUMINESCENCE COMPOUNDS AND MIXTURES BY CHEMICAL TRANSFORMATION OF FLUX**

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Fluoroscopic flaw detection in comparison with such methods of detecting of mikrocraks as: magnetic – field testing, x-ray inspection and neutrone inspection is high effective. This method is exact, cheap and easily realized. On the basis of this method the magnetic and nonmagnetic parts of machines, metalworks, concrete, glass, ceramics, plasatics and other materials and products can be tested without their crush.

Fluoroscopic flaw detection is based on the penetration of penotrant (the solution of phosphor) into microcraks and glowing under the action of ultra-violet radiation. Phosphors must satisfy some demands: intensive and stable dlowing in greenish – yellow region of spectrum which is easily perceived by observer; high solubility in hydrocarbon solvents, with fogming of molekular solutions (they can easily penetrate into microcracks); must be in the respecte of corrozion of metals, cheap and accessible.

Exept of fluoroscopic flaw detection, phosphors are also used as technical and biological markers. The most important is their use in fluorescence microscopy. These phosphors have high fluoroscopic ability, but most of them are expensive and toxic.

Penetrants can be prepared on the basis of polynuclear fused aromatic and hetero-aromatic com-pounds. But the compound glow in blue-violet region, besides resinous compounds quenches luminescence.

These problems can be solved by chemical transformation of flux – by functionalization of polynuclear fused aromatic and hetro-aromatic compounds by amino, acyl, hydroxyl and others groups. This gives opportunity to separate resinous compounds.

From functionalized mixture it is easy to obtain new polycomponent luminescence mixture or individual compounds.

The result of the functionalization of flux, half-flux and some heavy fractions are discussed in the report.

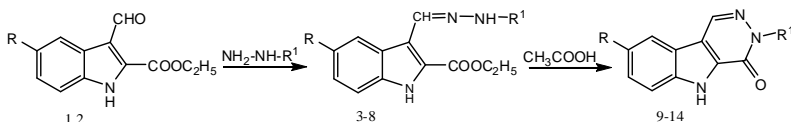
PP 87. **SYNTHESIS OF NEW 3- AND 8-SUBSTITUTED MONO AND DIHALOGEN DERIVATIVES OF PYRIDAZINOINDOLE**

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Pyridazinoindole – azaanalogue of β -carboline, the ring of which is the basis of wide variety of substances with high physiological activity, has attracted attention of researchers in recent years. Many derivatives of isomeric pyridazinoindoles reveal high biological activity [1-5], while others were identified as effective intercalators of DNA.

3- and 8- mono and dihalogen substituted derivatives of 4-oxo-pyridazino[4, 5-b]indole were carried out according to the following scheme:



R= Cl, Br, (1;2)

R= Cl, R¹= -C₆H₄Cl (3;9);

R= Br, R¹= -C₆H₄Cl (6;12);

R= Cl, R¹= -C₆H₄Br (4;10);

R= Br, R¹= -C₆H₄Br (7;13);

R= Cl, R¹= -C₆H₄-C₆H₅ (5;11);

R= Br, R¹= -C₆H₄-C₆H₅ (8;14);

Reference:

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PP 88. **MATHEMATICAL – CHEMICAL INVESTIGATION OF THE
IONIZATION POTENTIALS OF PYRROL AND ITS CHALCOGEN –
ANALOGOUS**

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Within the scope of mathematical-chemistry, on the basis of the Block-matrices (B – matrices) method the investigation of the first ionization potentials of pyrrol and its chalcogen – analogous was carried out .





The simple model for these heterocyclic compounds was ellaftorated:

$$X = Y \quad (1)$$

where: $X \equiv O, S, Se, Te$; $Y \equiv C_4H_4$, Corresponding B – matrix [1] has the form:

$$\begin{vmatrix} Z_x & 2 \\ 2 & Z_y \end{vmatrix} \quad (2)$$

The values of $\lg(\Delta_B)$ and I_1 for heterocyclic compounds are represented bellow:

Compound	$\lg(\Delta_B)$	I_1 , eV
	2.34	10.32
	2.65	9.49
	2.98	9.18
	3.18	8.88

The correlation equation was constructed on computer:

$$I_1 = -1.71 \lg(\Delta_B) + 14.32$$

The correlation coefficient „r” is equal to 0,982. Thus, according Japhe’s criterion, the correlation is satisfactory.

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PP 89. **POLYAMIDOARYLATE SYNTHESIS ON THE BASIS OF
CYCLOPARAFINIC BISPHENOLS BY HIGH TEMPERATURE
POLYCONDENSATION METHOD**

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Polyamidoarylate on the basis of cycloparafinic bisphenols by their complex properties are very interesting among polycondensation polymers.

Earlier we obtained polyamidoarylates on the basis of polycyclic bisphenol 4,4'-(hexahydro-4,7-methyleneindane-6-yliden) diphenol, sebacic and terephthalic acid chloranhydrides and hexamethylenediamine.

We were the first who determined the regularity of formation of polyamidoarylates with norbornane groupings in polymer chain by the method of high temperature polycondensation.

Correlation of polyamide arylates of one and the same composition, obtained by the acceptor-catalytic high temperature polycondensation methods shows that they differ from each other by the content of chloroform-soluble and insoluble parts, by elementary composition of these parts and temperature of softening.

It was proved that such difference in polyamidoarylates is conditioned by different structure of their polymer chains.

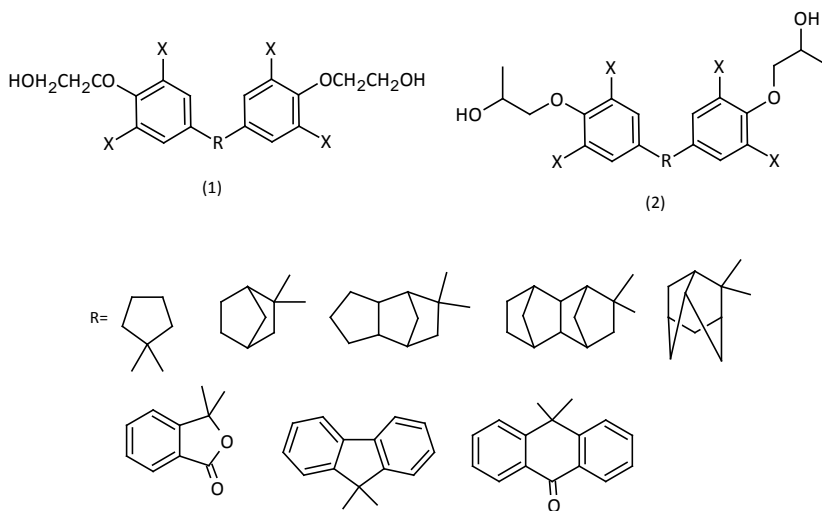
The presence of exchange reactions was observed proceeding between the block type macromolecules of polyamidoarylates at heating, leading to the formation of polyamidoarylates with static distribution of links in the polymer chain.

PP 90. **SYNTHESIS AND INVESTIGATION OF CARD POLYURETHANES**

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Homogeneous, linear polyurethanes have been synthesized on the base of card type diols. Diols containing cycloaliphatic – cyclopentane, cyclohexane, norbornane, adamantane and cycloaromatic – phthalide, flourene and anthrone card groups were used for the synthesis of polyurethanes. Methods of synthesis of primary and secondary diols were developed. Primary diols (1) were obtained by interaction of bisphenols and ethylene oxide, while the secondary diols (2) were obtained by interaction of bisphenol with propylene oxide in alkaline medium.



X=H,CH₃, Cl

Polyurethanes were synthesized on the base of diols, aliphatic and aromatic di-isocyanates. Synthesis proceeds by migration polymerization mechanism. The main kinetic regularities of polymer formation have been studied. Optimal conditions were defined for obtaining polyurethanes. Relationship of polyurethanes properties and the chemical structure of polymer chain was studied.

Polyurethanes synthesized on the base of card type diols are characterized by high heat resistance and good solubility in organic solvents. These properties of

polyurethanes are conditioned by the presence of card type cycles bounded to the central hydrogen atom between oxyphenyl nuclei of diols component.

Study of card group containing polyurethanes showed that heat resistance of industrial polymers obtained on the base of aliphatic diols, as well as that of polymers not containing card groups which stand close to polyurethanes by their chemical structure.

Heat resistance of polyurethanes obtained on the base of primary diols is higher than that of polyurethanes obtained on the base of secondary diols, which is explained by the presence of methyl group in secondary diols molecules.

Polyurethanes properties are also affected by the diisocyanate structure. At the substitution of aliphatic diisocyanate with aromatic one, heat resistance is increased markedly. Roentgenostrumctural analysis proved that polyurethanes synthesized on the base of card type diols have amorphous structure.

Dynamic thermogravimetric analysis proved that decrease of mass of the synthesized polyurethanes starts at 280-300 °C, while intense mass decrease within the interval 300-400 °C.

PP 91. **PHENOPLASTS ON THE BASIS OF MINERAL**

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The resol type phenolformaldehyde oligomers have been used for receiving the new type thermally reactive, high quality filled polymeric compositions. The mineral raw-material-diatomite has been chosen as filler. The content of the filler in composition reached 30-80 mass %. The composition was processed by compressive pressing under heating. Main technological parameters have been established: temperature 180 °C, specific pressure 60 MPa, delay time – 40 sec. (per 1mm thickness of product).

The physical-mechanical and dielectric indices of plastic material obtained as a result of processing of polymer compositions have been studied.

In polymeric compositions content of diatomite was changed from 30 to 80 %. It is shown that the foam plastics containing 30 mass % diatomite has relatively lower indices of strike strength and their dielectric indices are relatively lower as well. When the content of diatomite is up to 80 mass %, the mechanical and dielectric indices of foam plastic (electric strength – kv/mm=22.0; specific surface electric resistance – Ohm=5.5x10¹⁵; the specific volumetric electric resistance, Ohm.cm=2.5 x 10¹⁵) is much higher than the indices of foam plastic of analogous destination known today.

It has been established that the compositions are of optimal composition in which the content of diatomite equals to 40-60 mass%.

Expensive and deficient traditional fillers in polymer compositions can be changed by much cheaper and easily accessible local natural mineral material – diatomite.

PP 92. **POLYPHENYLENE OXIDE MODIFIED BY FLUORINE OLIGOMERS**

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In antifriction plastics aromatic simple polyester – polyphenylene oxide (PPO) has been used as a binder. But the insufficient stability of PPO in the process of friction conditions needs the necessity of its modification.

Modification of PPO has been carried out by fluorine containing oligomers - fluorine alkanes: $\text{Cl}(\text{CF}_2)_n\text{H}$, where $n = 7 - 12$ and by $\text{Cl}(\text{CF}_2)_n\text{OSO}_2\text{F}$ where a privilege of $n=7-12$. The privilege of fluorine alkanes in comparison to other modifiers is expressed in organic solvents by good solubility, high temperature of decomposition and possibility of receiving low disperse product during crushing.

In polyphenylene oxide modified by fluorine alkane after pressing at 300°C there is observed formation of insoluble fraction in chloroform by 70%. Content of insoluble part lesser depends on the number of fluorine alkanes (up to 1 – 7 %) and the nature of extreme groups.

By the method of mass-spectrometry it has been studied a process of thermal decomposition of modified PPO at temperature 300°C together with the products of thermal decomposition characteristic for PPO, there have been observed in great quantity the destruction products of fluorine-alkanes: $\text{CF}_2 - m/z\ 50$, $\text{HCF}_2 - m/z\ 51$, $(\text{CF}_2)_2 - m/z\ 100$, $\text{H}(\text{CF}_2)_2 - m/z\ 101$.

Modification of PPO by fluorine alkane improves the friction properties of polymer: the wear – resistance is increased twice; friction coefficient is reduced from 0.35 to 0.25. The modified polymer has low and stable friction coefficient within the wide range of temperature – up to $50 - 225^\circ\text{C}$.

PP 93. **KATIONITES ON THE BASIS OF ZEOLITE**

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One of the actual problems is purification of liquids, drainage and drinking waters from salts. On the basis of natural sorbent – clinoptilolite, cationite of high and low ion exchange capacity, comprising of strong and weak ionogen groups has been synthesized. The natural zeolyte – clynoptilolite, the oxide formula of which is – $(\text{Na}_2\text{K}_2\text{Ca}) \text{OAL}_2\text{O}_3 10 \text{ SiO}_2 \cdot 8\text{H}_2\text{O}$, is characterized by high thermal stability, porosity and plays a role of a matrix.

In pores of clynoptilolite in presence of catalysis, on the first stage there was implemented a phenol molecule, further at 125–135 °C, during polycondensation with aldehyde there was created a growing oligomer of phenol-formaldehyde resol type. The methylol group reacts with groups of silanol available in zeolite, as well with each other and there is created a polymer having a spatial structure in which on the further stage through the sulphures there is performed introduction of active sulphur groups.

By studying the effect of various factors which influence on the value of statistic exchane capacity of cationite the optimal conditions of receiving the cationite, the relation between the zeolite and phenole, mas %: 85:15 have been established. The temperature of polycondensation reaction is 125 – 135°C, duration of the process of sulphuration is 2- 3 hours.

The statistic exchange capacity of cationite received by this method equals to 5.5 – 8.0 mgekwg⁻¹ (relative to. 0.1 N HCl)

PP 94. **SYNTHESIS OF BIFUNCTIONAL DYES WITH ISOLATE-CONJUGATED
 π -SYSTEM**

L. Akhlouri, I. Legashvili, E. Elizbarashvili

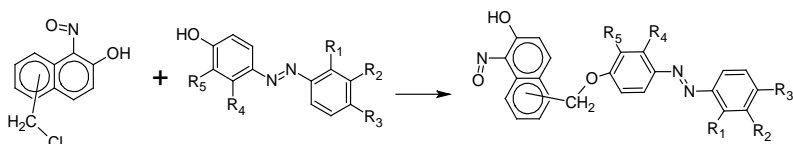
Georgian Technical University, Georgia
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The application of synthetic dyes in textile industry requires blend or combination of dyes. However, in case of blending or combination of dyes the persistency of the sample is lower then single dye application.

To address the above mentioned challenging issue there have been synthesized multi-functional dyes that contain isolated $-\text{CH}_2-$ chromophoric systems. Azo and nitroso groups were applied as chromophores.

Nitroso-azo ligands containing chloromethylene linkages were obtained based on reaction between chlormethylenated compound and azo dyes.

The process of immobilization was carried under the nitrogene environment in the toluene media. Based on series of experiments it has been established that the optimal temperature of immobilization is 60 °C.

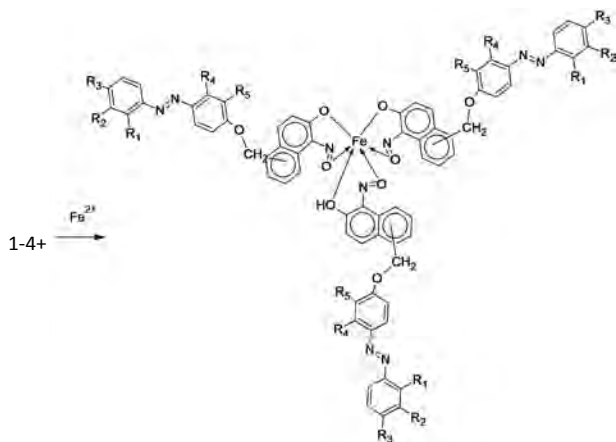


- 1 $\text{R}_1=\text{H}$, $\text{R}_2=\text{NO}_2$, $\text{R}_3=\text{H}$, $\text{R}_4=\text{OH}$, $\text{R}_5=\text{H}$
- 2 $\text{R}_1=\text{H}$, $\text{R}_2=\text{NO}_2$, $\text{R}_3=\text{H}$, $\text{R}_4=\text{H}$, $\text{R}_5=\text{H}$
- 3 $\text{R}_1=\text{H}$, $\text{R}_2=\text{NO}_2$, $\text{R}_3=\text{H}$, $\text{R}_4=\text{H}$, $\text{R}_5=\text{COOH}$
- 4 $\text{R}_1=\text{H}$, $\text{R}_2=\text{H}$, $\text{R}_3=\text{NO}_2$, $\text{R}_4=\text{OH}$, $\text{R}_5=\text{H}$

Scheme 1. Synthesis of methylene linkage containing nitrosoazoligands based on azobenzene

Obtained dyes 1-4 may have been employed for the synthesis of mordant dyes (scheme 2).

Synthesized mordant dyes characterized with excellent properties.



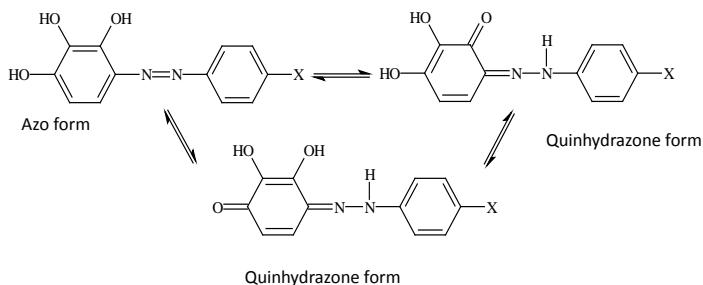
Scheme 2. Synthesis of mordant dyes

PP 95. INVESTIGATION OF THE FORMS OF AZOCOMPOUNDS ON THE
BASIS OF PYROGALLOL IN SOLUTION

R. A. Aliyeva, Kh.D. Nagiyev, A. M. Maharramov, F.M. Chiragov

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A number of azocompounds - 2,3,4-trihydroxyphenylazo-5'-sulphonaphtha-lene (R_1), 2,2',3,4-tetrahydroxy-3'-sulpho-5'-nitroazobenzene R_2 , 2,2',3,4-tetra-hydroxy-3'-sulpho-5'-chlorineazobenzene (R_3), 2,3,4-trihydroxy-4'-sulphoazoben-zene (R_4), 1-phenyl-2,3-dimethylpyrazolon-5-azopyrogallol (R_5) and 2,3,4-trihydroxy-4'-chlorineazobenzene (R_6) have been explored. Structure and constitution of this compounds were ascertained by methods of elementary analysis, infrared and NMR spectroscopy. Dissociation constants were determined by the method of potentiometric titration. Proved that R_2 and R_3 are five-basic (H_5R), R_1 and R_4 - four-basic (H_4R), R_5 and R_6 are three-basic (H_3R) weak acids. The absorption spectrums of the azocompounds were investigated at the wide range wavelength ($\lambda=300-700$ nm) and at different acidity (pH 0-14). Proved that these compounds under study exhibit the properties of acid-base indicators and depending on acidity appear in the solution in different forms - protonated, molecular and anion form. Transition from one form to another accompanied by bathochromic or hypsochromic shifts. Azocompounds R_2 and R_3 in solution appear in protonated (H_6R^+), molecular (H_5R or H_4R^+) and four anion (H_3R^{2-} , H_2R^{3-} , HR^{4-} , R^{5-}) forms, R_1 , R_4 - R_6 appear in protonated (H_5R^+), molecular (H_4R or H_3R^+) and three anion (H_2R^{2-} , HR^{3-} , R^{4-}) forms. Also proved, that test compounds in solution exist in two tautomeric forms - azo and quinhydrazone forms. In more acidic conditions dominate quinhydrazone form and in an alkaline conditions dominated azo form. Tautomeric forms of the azocompounds (R_4 and R_6) are presented below:



$X = -SO_3H$ (R_4), $-Cl$ (R_6)

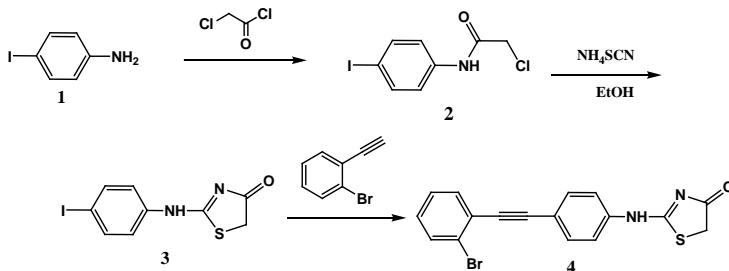
PP 96. **SYNTHESIS OF BIOLOGICALLY ACTIVE INDOLES: PREPARATION OF
2-(4-(1H-INDOL-2-YL)PHENYL-AMINO)THIAZOL-4(5H)-ONE**

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An indole ring system is one of the most prevalent subunits in natural product chemistry and is of interest for organic chemists for more than a century [1]. Thiazoles are an important class of natural and synthetic compounds. Thiazole derivatives represent a wide range of biological activities such as anesthetic [2] and inflammatory[3]. In view of their pharmaceutical applications, the synthesis of thiazoles is important.

The main goal of the present project was synthesis of 2-(4-(1H-indol-2-yl)phenyl-amino)thiazol-4(5H)-one (**5**). The product contains indole and thiazole moieties, which themselves are biologically very interesting substructures.

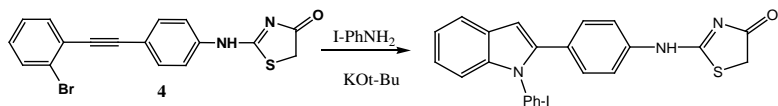


Scheme 1

An initial compound p-iodoaniline was subjected to acylation giving an amide **2**. Further cyclization of the amide with ammonium thiocyanate gives a corresponding aminothiazolone **3**.

The Sonogashira coupling reaction of the compound **4** with arylacetylene was tested in different solvents (TEA, DMF, THF) at various temperatures. The optimum conditions for reaction are found to be: Solvent - dried DMF, Temperature- 30 °C, Reaction duration - 4h.

The latter pathway represents a highly flexible and efficient methodology, yielding the indole backbone [4]. These transformations proceed via a palladium- or a copper-catalyzed amination reaction and a subsequent cyclization reaction (Scheme 2).



Scheme 2.

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PP 97. **SYNTHESIS OF SUBSTITUTED FURANS VIA THE STEVENS
REARRANGEMENT OF AMMONIUM COMPOUNDS, CONTAINING
PHENACYL GROUP**

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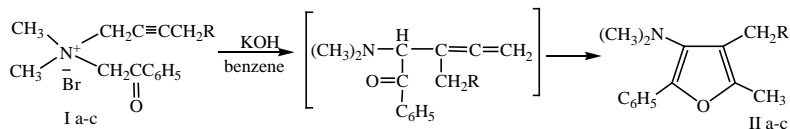
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According to the literature sources, ammonium compounds, containing along with propargyl or potentially propargyl-type groups phenacyl or acetonyl functions, under the action of basic reagents undergo 3,2-Stevens rearrangement, and the formed diene aminoketones are resulting in corresponding cyclopentenones by the intramolecular condensation [1,2].

It was established by us, that as opposed to the earlier investigated ammonium compounds, dimethyl-4-allyloxy(phenyloxy)butine-2-yl phenacylammonium bromides under the action of potassium hydroxide undergo 3,2-Stevens rearrangement with the formation of allenic type aminoketones, which, in the reaction conditions, transform into derivatives of furan [3].

In continuation of our research, we have investigated the rearrangement of ammonium compounds I a-c, containing in the 4-th position of the butin-2-yl substituent, diethylamino, piperidino and morpholino groups. The initial compounds were synthesized with high yields by the interaction of corresponding diamines with the phenacyl bromide in the molar ratio 3:1 in absolute ether. The Stevens rearrangement of the indicated ammonium compounds was performed by the action of potassium hydroxide powder in absolute benzene.

The obtained results are indicting, that the rearrangement of the ammonium compounds Ia-c flows analogously to that of the salts with 4-allyloxy(phenyloxy)butine-2-yl group, leading to the formation of derivatives of furan IIa-c with 40-45% yields.



R = N(C₂H₅)₂ (a); N(CH₂)₅ (b); N(CH₂CH₂)₂O (c)

The structure of obtained compounds was proved by the methods of IR and ¹H NMR spectroscopy; the purity of compounds was monitored by GC and TLC methods. The research is supported by the SCS of RA (11B-1d024).

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PP 98. **NON-CATALYTIC ALKYLATION OF ANILINE WITH 1,3,5-TRIMETHYL-4-HYDROXYMETHYL PYRAZOLE**

H. S. Attaryan, V. I. Rstakyan, S. S. Hayotsyan, G.V. Hasratyan

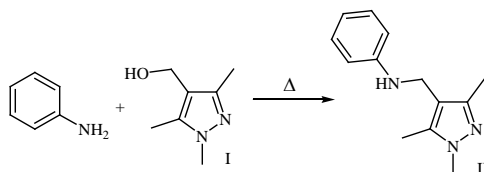
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It is widely known, that in substituted benzenes, if the substituent is amino-, hydroxyl-, methyl- or other similar first-order orientant, the electron density of the benzene ring is increased in general and particularly on ortho- and para- positions. This is causing the electrophilic substitutions of anilines, phenols, alkyl benzenes, etc. to occur on ortho- and para- positions of the ring.

As we have showed earlier [1], the same principle is true for non-catalytic alkylation of phenol with 1,3,5-trimethyl-4-hydroxymethyl pyrazole (I) where the total yield of C-alkylated products (mixture of ortho- and para- isomers) is 67 %.

Reasonably it can be assumed, that alkylation of aniline with 1,3,5-trimethyl-4-hydroxymethyl pyrazole (I) would also lead to the formation of ortho- and para-alkylation products.

Despite of that assumption, electrophilic substitution on the benzene ring of aniline does not occur. From the reaction mixture instead of C-alkylation product, the N-alkylation product (II), formed according to the scheme, was isolated and characterized.



The structure of compound (II) was proved by the methods of IR, ^1H and ^{13}C NMR spectroscopy and elemental analysis.

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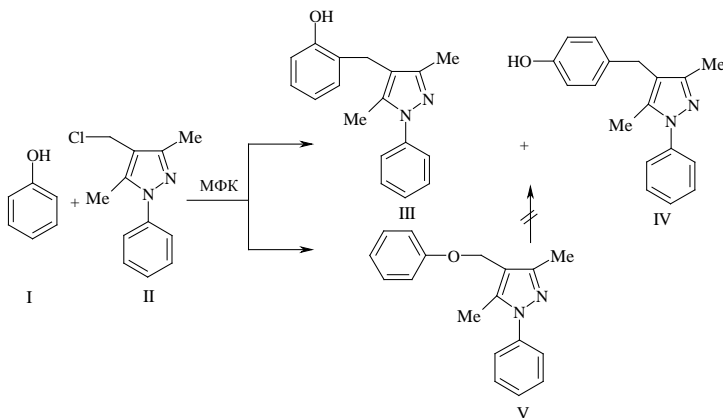
PP 100. **ALKYLATION OF PHENOL WITH 1-PHENYL-3,5-DIMETHYL-4-CHLOROMETHYL -PYRAZOLE UNDER THE CONDITIONS OF THE INTERPHASE CATALYSIS**

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It was reported earlier that heating of the 1,3,5-trimethylpyrazol-4-yl-methanol in the presence of benzyl and hexyl alcohols predominantly leads to the formation of mixed ethers of trimethylpyrazolcarbinol [1]. The similar reaction of trimethylcarbinol with phenol leads not to the pyrazolyl methylphenyl ether, but to the C-alkylation products of phenol's aromatic nucleus in the ortho- and para- positions [2].

With the purpose to reveal whether the C-alkylation product of phenol is formed via the formation of phenyl pyrazolymethyl ether [3], in current work the data concerning to the alkylation of phenol (I) by 1-phenyl-3,5-dimethyl-4-chloromethyl-pyrazole (II) under the conditions of phase-transfer catalysis is given.



When alkylating the phenol, the formation of ambident ions is not excluded [4], and in this case O- alkylation as well as C-alkylation products can be formed. Thus, by the alkylation of phenol (I) with 1-phenyl-3,5-dimethyl-4-chlormethylpyrazole (II) we have isolated and characterized products of O- (V) and C-alkylations (III, IV) in 1:1 ratio with general yield of 63%. According to ¹H NMR spectra the C-alkylated products (III, IV) represent the mixture of ortho- and para- isomers in the ratio 9:1. The signal of the hydroxyl proton of the ortho- isomer (III) appears in the weaker field (8.99 ppm) than the similar signal of isomer (IV) (8.21 ppm). The isomer (III) after recrystallization is isolated in the pure form.

Further studies have shown that the product of O-alkylation of phenol (V) does not undergo any transformations by the heating to 200°C (it is not transformed into the product of C-alkylation). On the basis of this data it can be concluded that noncatalytic alkylation of phenol by 1,3,5-trimethylpyrazole-4-yl-methanole leads exclusively to the C-alkylated products [2].

The structure of compound (II) was proved by the methods of IR, ^1H and ^{13}C NMR spectroscopy and elemental analysis

References

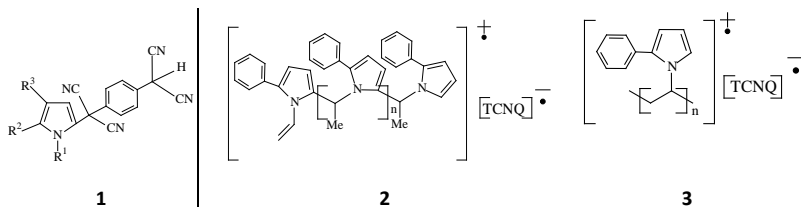
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PP 101. INVESTIGATION OF ION-RADICAL SALTS ON THE BASIS OF
PYRROLES AND POLYPYRROLES WITH TCNQ BY EPR

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Pyrrolic **1** and polypyrrolic **2, 3** systems with deep intramolecular charge transfer (ion radical salts) have been synthesized by reaction of 1H- and 1-vinylpyrroles and polypyrroles with tetracyanoquinodimethane (TCNQ). Obtained high and easy polarizable compounds show perspective properties for optoelectronic technologies.



The product **1** possesses of paramagnetism ($N = 1020\text{-}1021$ spin/g), that is caused by electron transfer from TCNQ to a molecule of corresponding pyrrole. Independently of a initial pyrrole structure all 1,6-adducts in solid give in EPR spectra the intensive too narrow (0.08-0.15 mT) singlets (see figure). The Daysonian line form caused by absorption of microwave power in a thin surface layer of sample the so-called skin-effect is inherent in materials with "metal" properties. Samples are storageability of paramagnetism on air and light. Furthermore, paramagnetism is kept in solutions of DMSO, THF and acetonitrile. At sufficient letting down their solutions show the hyperfine structure of EPR signal which is identified as a signal of TCNQ radical anion.

During reaction of pyrroles with TCNQ in EPR cell both in solutions and solid phase in inert atmosphere are shown a becoming of stable bright color and observed signals in EPR spectra – well resolved signal of TCNQ radical anion [1, 2] in solution or symmetric singlet ($\Delta H = 0.38$ mT and $g = 2.002(5)$) in a solid state. At dissolution of solid reactionary mixture in DMSO the EPR signal is transformed into multiplete, identical to observed signal at the same reaction in solution of DMSO, corresponded to TCNQ radical anion [1, 2]. It confirms, that the reaction is carried out with electron transfer with formation of a simple ion-radical salts of composition 1:1, which dissociate in solutions on free unstable cation-radicals of pyrroles and stable anion-radical of TCNQ. High concentration of paramagnetic centers (up to 10^{21} spin/g), very narrow lines (order of 0.1 mT) describable by the

Daysonian line – typical characteristics for samples with "metallic" conductivity, that can evidence of dense packing of ions-radicals or the structure of the products have zwitterion character [3]. Such structures at dissolution in polar solvated solvents also can dissociate with formation of radical cation- and anion-radicals.

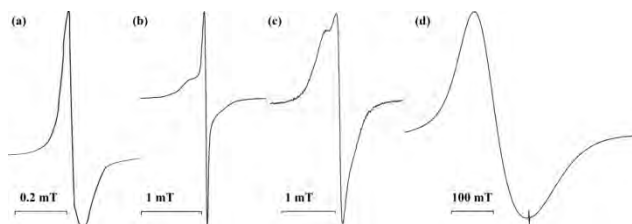


Figure. Typical EPR spectra for solid state compounds: (a) – 1, (b) – 2, (c), (d) – 3.

The products **2** and **3** on the basis of polypyrrole, are obtained by cation or radical polymerisation of 1-vinyl-2-phenylpyrrole, also form with TCNQ into ion-radical salts giving in EPR spectra two superposed symmetric singlets with different width (order of 0.1 and 0.5 mT) and nearest value of g -factors in the range of free radicals. The method of deep saturation by microwave power has shown that singlets with great value of the g -factor are saturated faster and correspond to polypyrrolic cation-radicals, but the narrower signal is corresponded to TCNQ anion-radicals. As corroboration it is served by EPR spectra of diluted solutions in DMSO of the specified ion-radical salts in which the well resolved signals of TCNQ anion-radicals also are registered.

In addition, in EPR spectra of ion-radical salts **3** in low fields are observed the intensive wide signals (ΔH over 100 mT) with g -factor of 2.31-2.55 (see figure), that are testifying to formation of ferromagnetic domains with the ordered collective interactions of spins [4] and can be represented perspective for their application in the electronic techniques and nanotechnologies.

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PP 102. TO QUESTION OF ESTERIFICATION OF 3- AND 4-PYRAZOLE
CARBOXYLIC ACIDS

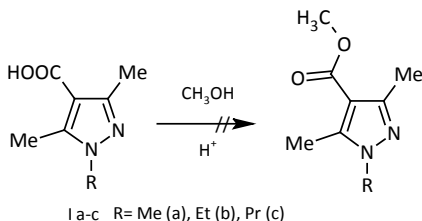
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It is known that ortho- disubstituted benzoic acids are etherifying by alcohols in the presence of hydrochloric acid extremely slowly or not esterifying at all [1]. The esters of these acids are easily formed from their silver salts under the action of alkyl halides. However, these esters are in a high degree resistant to the action of the hydrolyzing agents: they are hydrolyzed extremely slowly. Substituents are creating sterical hindrances for the attack of carboxyl carbon of ester and acid by the molecules of water and alcohol respectively [2]. On contrary, the ortho- disubstituted phenylacetic acids, in which the carboxyl group is not directly connected with the benzene ring, are esterified, and their esters are easily hydrolyzed [2].

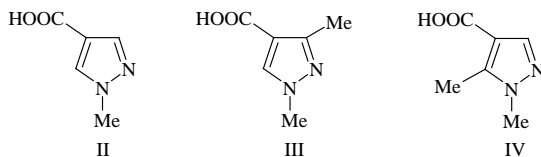
The reason of the abovementioned impact of substituents cannot be referred to the electronic effects of substituents because as electro acceptor as well as electro donor substituents are causing the similar effects. Thus the main reason is probably the steric hindrance of functional groups [2]. Because pyrazoles are also aromatic compounds it was interesting to investigate the etherification of di-ortho-substituted 4-pyrazole carboxylic acids and compare it with the similar process for benzoic acids.

We have investigated the etherification of 1-alkyl-3,5-dimethyl-4-pyrazole carboxylic acid (I), which to our concern is analogous to ortho- disubstituted benzoic acids.

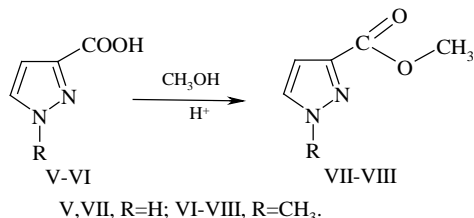


The first experiences showed that the substances Ia-c are not absolutely etherifying by methanol in the presence of hydrochloric acid, i.e. they act analogously with the orthodisubstituted benzoic acids.

For the purpose of the development of electronic or spatial character of the action of substituent on the etherification process we studied also the etherification 1-methyl, 1,3-dimethyl, 1,5-dimethyl-4-pyrazolcarboxylic acids (II -IV).



The etherification of the indicated acids also does not occur. On the example of substance II it is already clearly evident that in this case the steric effect of alkyl substituent is not determining. Basic reason, probably, consists in the electronic action of carboxyl group on the heteroatom of pyrazole ring. In order to reveal this kind of reaction in the 4-pyrazolcarboxylic acids (I-IV) we studied the etherification of 3-pyrazolcarboxylic acids (V, VI). The etherification of 3-pyrazolcarboxylic acids (V, VI) proceeds easily with the high outputs. In the processes of etherification were used different acid catalysts (H_2SO_4 , HCl , POCl_3). In this case the yields of ethers of 3-pyrazolcarboxylic acids reached by 73-80%.



This behavior of investigating pyrazole carboxylic acids (I-VI) as was assumed is connected with a distinction of their basicity. In the 3-pyrazolecarboxylic acids (V, VI) the basicity of pyridine nitrogen is reduced due to the electron-acceptor effect of carboxyl group, while in pyrazoles (I-IV) this interaction is absent. Consequently they form the cation of pyrazole more easily, which prevents the reaction of etherification.

IR spectra are obtained on the device Spekord 75-UR (thin layer), the NMR spectra of ^1H are taken on device Varian Mercury (300 MHz) in DMSO-d_6 .

Initial 3- and 4-pyrazolecarboxylic acids (I-VI) were synthesized according to the known techniques, offered in the works [3-6].

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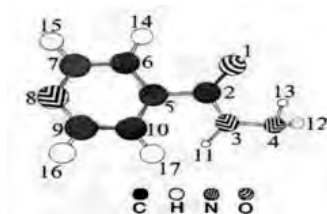
PP 103. **QUANTUM-CHEMICAL STUDY OF THE INFLUENCE OF THE SOLVENT ON COMPLEX FORMATION CAPACITY OF ISONICOTIN HYDRAZIDE WITH METALS**

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G. Tsintsadze**

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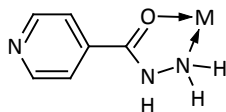
Isonicotin hydrazide is the major representative of isonicotin acid hydrazide derivatives, which found its application as the anti-tuberculosis means (synonyms: Isoniazide, Turazide et al).

To study the effect of solvent on the complex formation capacity of isonicotin hydrazide with metals, its energetic, electronic and structural characteristics were calculated by semi-empirical AM1 method in gaseous state and in various solvents differing in ϵ -index (water-78.5, dimethyl sulphoxide-49.0, methanol-32.6, ethanol -24.3, acetone -20.7, chloroform -4.7, hexane -1.9). According to the formation heat (ΔH kJ/mol) the molecule is most stable in water. Solvents condition the various rates of increase of dipole moment of isonicotin hydrazides, which is explained by formation of additional induced dipole moments by them.

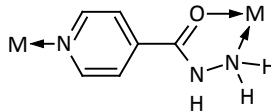


On O(1), N(8) and N(14) atoms charge size at the effect of the solvent grows from hexane to water, while on N(3) atom, it decreases. Such distribution of charges on these atoms is conditioned by the peculiarities of solvent effect. According to electrons dislocation on their atom orbits we determined that oxygen O(1) atom has clearly expressed σ -link formation capacity of complex formation with metals. Among the nitrogen atoms the same property is inherent to amine group N(14) and hetero cycle N(7) nitrogen atoms. Compared with the gaseous state, the solvents insignificantly decrease the capacity of complex formation with metals through these atoms.

Therefore, we can conclude that isonicotin hydrazide molecules are able to coordinate with metals as follows:

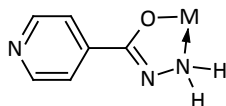


I structure

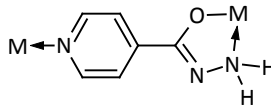


II structure

In case of diproton molecules as follows:



III structure



IV structure

On the basis of our experimental and special literature data [], by the study of synthesis, structures and properties of Mn (II), Co (II), Fe (II,III), Cu (II). Zn and Cd, Mg, Ca and other metals' halogenides, pseudo-halogenites, nitrates, sulfates coordinated compounds – realization of the above structures was proved. The above-mentioned fact refers to good conformity of quantum-chemical computations and experimental data.

PP 104. THE BORON-CONTAINING COMPLEXES OF NITRO- AND ANTHRAQUINONE DYES

M. Sharabidze

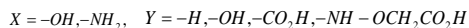
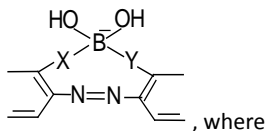
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Direct and acid dyes are often used in the textile industry. They are characterized by the bright and sated coloring. However, their basic lack is low stability of coloring to wet processing. For an improvement of this property salts of heavy metals (chrome, copper, etc.) are used.

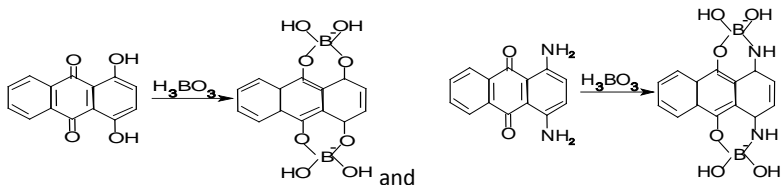
Metals with the molecules of dyes and textile materials form complex compounds and the connection between them raises color stability is improved. However, the application of chromium and other heavy metals is limited from an ecological point of view. Also coloristic indicators of colorings considerably change. Coloring becomes less sated and bright.

We selected boric connections, in particular borax, as the complexor. It is capable of forming complex compounds, since boron atom, even in the excited state, has free electronic orbital. It can will be arranged the electron pair of the element of donor. By element donor can prove to be different atoms of direct and acid dyes. These dyes relate to the nitro- and anthraquinone connections and the formation of boric complexes with them is possible to present in the following form:

At nitro dyes:



At anthraquinone dyes:



Considerably, that these complexes are characterized by good stability as the ligand is a alkali.

From the scheme is visible that in formation of complexes participate groups with heteroatoms which are connected by double communication. For them are characteristic $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ electronic transitions at the absorption of emissions. Boric complexes are formed at the expense of free electronic pair (by that not binding electrons) heteroatom. Therefore, at the analysis of results spectroscopic research are especially important those sections of absorption which indicate specify in $n \rightarrow \pi^*$ electronic transitions.

We investigated a change of optical densities of nitro- and anthraquinone dyes ($7,2 \cdot 10^{-6}$ mole/l) with the additions of borax ($8 \cdot 10^{-4}$ g/l) in the UV and the visible areas of a spectrum. Studies are carried out on the spectrophotometer CФ -26.

At the analysis of the strips of absorption in the UV spectrum areas, practically, for all nitro- dyes the absorption in the region of 350 nm is revealed, that indicates to the $n \rightarrow \pi^*$ transition of the free electronic pair of the $-N=N-$ group. It testifies about inclusions of this group in a boric complex [9-10].

Besides, absorption strips in area 280 nm, which corresponds to $n \rightarrow \pi^*$ transition free electronic of the oxygen $=C=O$ group are revealed. This gives the possibility to draw the conclusion that oxygen, which enters into the $-COOH$ and $-CH_2O$ groups of anthraquinone, coordination is connected with boron.

The analysis of the visible range of spectrum showed that the optical density during the addition of borax rises, which does indicate an increase in the intensity of the boron-containing dyes. The studies of colorimetric characteristics showed that the brightness and the color tone of dyes, practically, do not change, and saturation considerably rises.

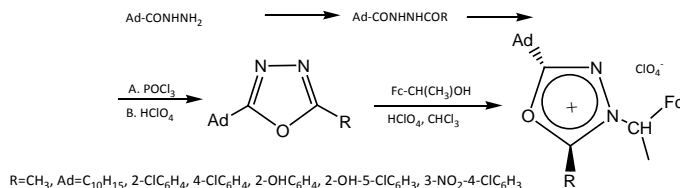
On the basis of the conducted researches is possible to say that borax can successfully replace heavy metals in the process of applying the nitro- and anthraquinone dyes at dyeing of textile materials. Thus received colorings are characterized by the raised stability to the wet treatments, colorimetric indicators do not deteriorate, intensity and saturation are improved, and the technology becomes ecological and safe.

PP 105. **SYNTHESIS AND INVESTIGATION SOME N-ACYLADAMANTANE-1-CARBOHYDRAZIDES AND OXADIAZOLES**

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Derivatives of adamantane containing compounds known for their antiviral activity [1,2]. Adamantane-1-carboxylic acid's N, N¹-diacylhydrazides showed as HIV inhibitors [3] and Oxadiazoles as antimicrobial and anti-inflammatory activities [4]. For the aim to research new bioactivity compounds were synthesized some N-acyladamantane-1-carbohydrazides, 2-(1-adamantyl)-5-R-1,3,4-oxadiazoles and corresponding N-ferrocenylalkyl derivatives according to the following scheme:



The acylation of adamantane-1-carbohydrazide with acetic anhydride and carboxylic acid chloride was carried out in presence of bases (TEA, NaHCO₃) and were obtained N-adamantoyl-N1-acylhydrazines in which cyclization were performed: A. In heating diacylhydrazine with POCl₃ for 10-15 minutes [4] and B. at boiling acetic anhydride in presence of 60% HClO₄ [5].

The interaction of α -Ferrocenylethanol with oxadiazoles were carried out in two-phase system: CHCl₃ / aqueous solution of an acid (HClO₄) with intensive stirring at room temperature were obtained the corresponding α -Ferrocenyl alkylation compounds converted of per chlorate in good yields. The structure of the products was confirmed by IR, UV and ¹H NMR data.

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PP 106. **UNEXPECTED FORMATION OF 1,2-DIKETONES FROM
1,3-DIKETONES MEDIATED BY RARE EARTHS**

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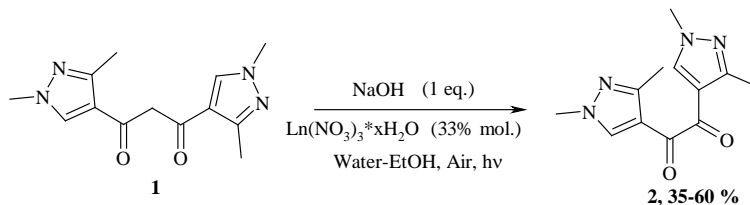
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Complexes of lanthanides with 1,3-diketones are widely use as NMR-shift reagents, fluorescent markers, laser active media, and active layres in different electrooptical devices, such as OLEDs [1]. As a rule, high yields of target compounds are achieved without any difficulties according well established procedures involving interaction of 1,3-diketone, alkali metal hydroxide and lanthanide salt (molar ratio 3:3:1).

Nevertheless, with novel ligand 1,3-bis(1,3-dimethyl-1H-pyrazol-4-yl)propane-1,3-dione (**1**) [2] in some experiments only low yields of desired complexes were obtained along with the formation of considerable amount of organic by-product which does not contained metal.

Composition of by-product was firstly established by single crystal X-ray diffraction and then confirmed by NMR, MS and elemental analysis.

We have found that under alkaline conditions (pH 7.5-8) compound **1** in the presence of oxygen and on the direct light converted to 1,2-diketone bearing the same substituents.



The nature of lanthanide ion does not affected significantly to the yield 1,2-diketone, but the highest yields were observed in the presence of gadolinium, terbium, dysprosium and thulium. The formation of 1,2-diketone are suppressed in the slightly acidic media (pH 6.0- 6.5), in the inert atmosphere and in the dark. No reaction was obtained in the absence of rare earth. Similar results were obtained with 1,3-Bis-(1-methyl-1H-pyrazol-4-yl)-propane-1,3-dione and 1,3-Bis-(1-ethyl-1H-pyrazol-4-yl)-propane-1,3-dione.

Due to our knowledge, the only one example of direct transformation of 1,3- to 1,2-diketone mediated by $\text{Ca}(\text{OH})_2\text{-I}_2\text{-O}_2$ system was reported up to date [3]. Scope and limitation of this new reaction now is under the consideration. We believe that after optimization it can be use as useful synthetic tool.

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PP 107. **SYNTHESIS AND INVESTIGATION OF SILICIUM CONTAINING
POLYBENZOXASOLES**

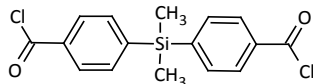
B. Butskhrikidze, I. Bochoidze, Ts. Turkadze

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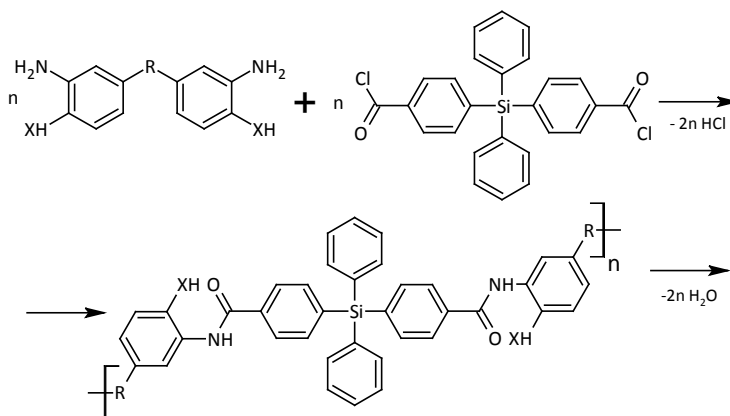
Polyoxasoles belong to one of the practically interesting and important classes of heterocyclic polymers. However, for the insufficient development of the necessary raw material base for their production and for converting them into pieces of finished products, this class of polymers has not yet found significant practical and broad application.

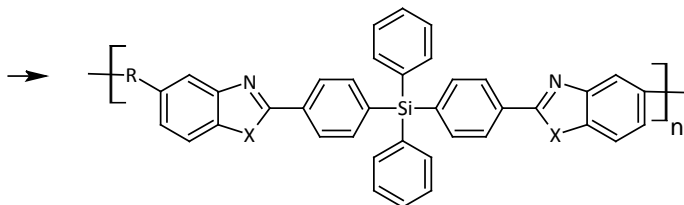
Among a lot of methods aimed at filling up this gap, one of the most important is bringing diphenilsillil groups, also not having yet found their application, into the basic chain of macromolecules.

Considering the above-mentioned facts the aim of this paper is to investigate the modification possibilities of polyoxasoles by means of the introduction of diphenilsillil fragments into the basic chain. Hence, *n*-carboxyphenilsilan of diphenils has been chosen for the initial monomer,



and binuclear bis-O-aminophenols, comprising carbonyl and methylenic "bridging" groups as the monomer. For the synthesis two-stage catalytic polycyclodehydration method has been chosen:





Methylpirolidon has been chosen as solvent owing to its properties indicated below:

1. Compared with the other amidic solvent methylpirolidon reacts with chloranhydrates less energetically, that's why it is assumable that in case of its application, a polymer of high viscosity and molecular-massive properties can be derived.
2. Methylpirolidon, compared with the other amidic solvents is characterized with high boiling temperature ($T=202^{\circ}\text{C}$) that provides capability of performing polyheterocyclization within the wider temperature intervals;
3. Methylpirolidon is a less toxic substance.

The study of the natural development of the synthesis of the poly (-O-oxy) amid, intermediate product, showed that one can get poly (-O- oxy) amides of maximum viscosity and molecular-massive properties in case the initial monomers' molar ratio is 1.02:1.00.

The structure of the derived poly (-O- oxy) amides has been attested by the data of the IR analysis. Polyoxisoles containing diphenilsillil has been adopted by way of the catalytic polyheterocyclodehydration of the corresponding poly (-O- oxy) amides.

The IR analysis of the derived poly (-O- oxy) amides containing diphenilsillil and of the polybenzoxasoles confirmed that cyclization processes are being carried on by vanishing the absorption maximums, characteristic to amid CO-NH and O-oxyamid OH groups.

On the basis of the experiment results I would like to conclude that modification of polyoxasoles by way of introduction of diphenilsillil groups into the basic chain improves their solubility and, correspondingly, the possibility of their processing into pieces of finished products. Particularly, synthesized diphenilsillil containing polybezoxasoles are easily soluble in such solvents as: methylpyrolidon, dimethylcetamid, trichlorethan and phenol mixture (3:1), metacrezole etc.

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PP 108. **GYPSUM MATRIX MODIFICATION WITH SILICON-ORGANIC COMPOUNDS**

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To modify inorganic matrixes sometimes there is applied of treatment with polymeric materials [1]. The gypsum having porous structure and materials prepared based on its content is less studied, so that scientists do broad research to this direction [2]. One of the most applicable organic compounds in matrix modification is silicon-, sodium- and boron containing thermo reactive monomers [3].

In the particular study the porous materials, including gypsum surface modification with silicon-nitric organic compounds, has been investigated.

The gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) small size ($20 \times 20 \times 20$) briquettes are displaced in the autoclaves in a newly synthesized hexamethylcyclotrisilazane (I) and octamethylcyclotetrasilazane (II) combination. Then, in common conditions it has been terminated for 36-40 hours. Then, 6 atmosphere (588402 pa) pressure is applied and again terminated for 20-25 hours [4]. Following to that gypsum samples wet with (I) and (II) solvent combinations are placed in dryer at $50-60^\circ\text{C}$. With the follow up treatment [5] of gamma-lights (1000 and 6000 grey), potentially in the gypsum porous is formed silicon nitride that causes rise of gypsum wet absorption and mechanical features.

The methodology of gypsum cycloalkylsilazane material modification at low temperatures is established, that raises its persistency towards organic solvents (polar, non-polar), water, acid and alkaline. At the same time, the capacity of wet-absorption is diminished from 8.71% to 1.87%.

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PP 109. **ORGANOSILOXANES MONOMERS AND OLIGOMERS WITH
AROMATIC-CONTAINING RADICALS AT THE SILICONE ATOM**

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Partial hydrolysis reactions of methyl – and phenyl- α - naphthildichlorosilanes was carried out using known method [1], corresponding products of reaction were excreted and characterized such as the following: 1,3-dichloro-1,3-dimethyl-1,3-di- α -naftildisiloxane; 1,3- dichloro-1,3-diphenyl-1,3-di- α -naftildisiloxane and 1,5-dichloro-1,3,5-triphenyl-1,3,5-tri- α - naftiltrisiloxane.

By hydrolysis of all three substances in alkaline area were obtained corresponding dihydroxy products.

Structure and content of the synthesized substances were ascertained using data of Infrared (IR) and Nuclear magnetic resonance (NMR) spectrometers.

The homofunctional condensation reactions of 1,5-dihydroxy-1,3,5-triphenyl-1,3,5-tri- α - naftiltrisiloxane in different solvents with and without catalysts on the boiling temperature of the used solvent was carried out. In reaction case of toluene area without catalyst is obtained α,ω -dihydroxyphenyl - α -naftilsiloxane with polymerrization degree $m=6$; but in toluene area with catalyst and also in dimethylformamide area without catalyst is obtained oligomer with polymerization degree $m=9$. Synthesized oligomers which were settled using hexane from toluene solution are light brown color powder-type substance with good solubility in organic solvents.

Were obtained organocyclotri – and tetrasiloxanes with two α -naphthalines radicals in molecule by heterofunctional condensation reaction of 1,3- dihydroxy-1,3-dimethyl-1,3-di- α - naftildisiloxane on dimethyl-, vinilmethyl – and methylphenyldichlorsilanes and also by reacting on 1,3 –dichlorotetramethyldisiloxane with equimolecular correlation of reacting components, on the low temperature, with triethylamine as a acceptor of hydrochloride.

Synthesized organocyclotri – and tetrasiloxanes are half- crystal, or sticky, colorless liquids, which have a good solubility in organic solvents. Structure and containing of obtained substances were investigated using elementary analysis, molecular mass determination, data of Infrared (IR) and Nuclear magnetic resonance (NMR) spectrometers.

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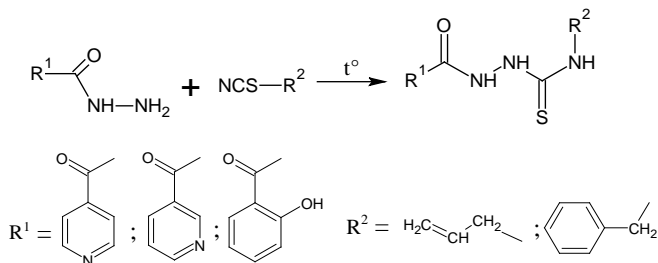
PP 110. **SYNTHESIS, PHYSICOCHEMICAL PROPERTIES AND BIOLOGICAL ACTIVITY OF NEW SULFUR-CONTAINING ORGANIC LIGANDS**

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In industrial conditions contact with heavy metal compounds causes sensitization of organism and starting allergic reactions in the staff. Learning properties of sulfur-containing ligands, heterocyclic derivatives of thiosemicarbazide showed possibility of creating complexes, biologically "inert" for organism, with these metals [1,2]. Insertion of such ligands into the organism produces tolerance to metals – allergens. Our choice of given ligands is also additionally motivated by positive influence of sulfur-containing compounds on the immune system of the organism [3].

We carried out synthesis of four new derivatives of thiosemicarbazide in ethanol solution according the scheme:



Taking in attention that antiviral and anti-tuberculosis activities [4] depend on thiosemicarbazide part of the molecule, it was interesting to check receiving a substance on biological activity. At first toxicity of test compounds for tissue specimens was determined in developing chicken embryos and on white mice according commonly accepted methods. Weak antiviral activity in relation with various viral strains was shown by all synthesized compounds in ovo and in vivo trials. More activity in ovo and in vivo trials on white mice, in comparison with trials on tissue cultures in vitro, can be explained by more solubility of compounds in biological fluids of live organisms.

Further we are planning synthesis of bio-complex compounds with received ligands.

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PP 111. SYNTHESIS OF ISOMERIC PYRROLOPHENOTHIAZINES

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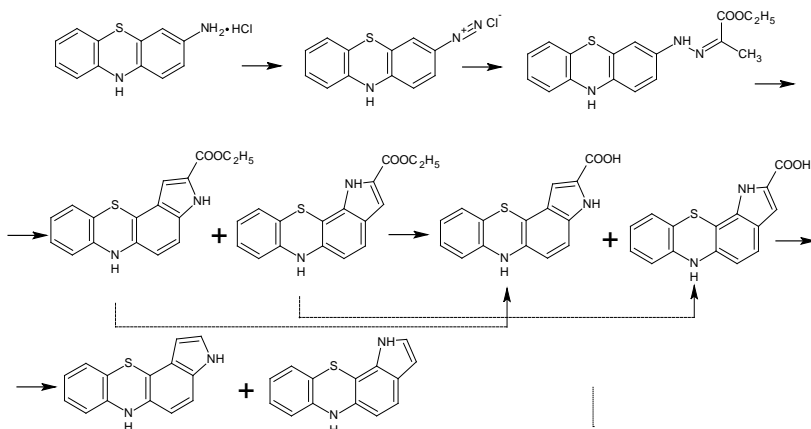
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Preparation technique of the synthesis of isomeric pyrrolophenothiazines of new heterocyclic systems is presented using E. Fisher classical method. The conditions of cyclizing of initial pyrovinic acid 2-aminophenothiazonil-hydrazone are studied. Sin- and anti-isomers relation and their structure are determined on the basis of contemporary spectral data.

Continuing the research in the synthesis of new unsubstituted tetracyclic pyrrol containing condensed systems [1, 2] we considered advisable the creation of such tetracyclic systems where heterocyclic systems of indole and benzothiazine would be simultaneously merged.

The interest to such merging was conditioned with the physiologic activity which is exposed by each of them separately.

We thought it interesting to create isomeric 3H-pyrrolo-[2,3-c]- and 1H-pyrrolo-[3,2-b]-phenothiazines where the above mentioned fragments are merged. For "attaching" of pyrrole nucleus to phenothiazine tricyclic system we used classical reaction presented by E.Fisher:



when diazonium salt received from phenothiazin 2-amino-derivative is transformed into hydrazone of pyrovinic acid ethyl ether from which by means of cyclizing ethyl ether polyphosphoric acid is transformed into isomeric 3H-pyrrolo-[2,3c]- and 1H-

pyrrolo-[3,2b]-phenothiazine carboxylic acid ethyl ethers.

The latters are transferred into respective acids and by means of decarboxylation of acids the unsubstituted 3H-pyrrolo-[2,3c] and 1H-pyrrolo-[3,2b]-phenothiazines are received.

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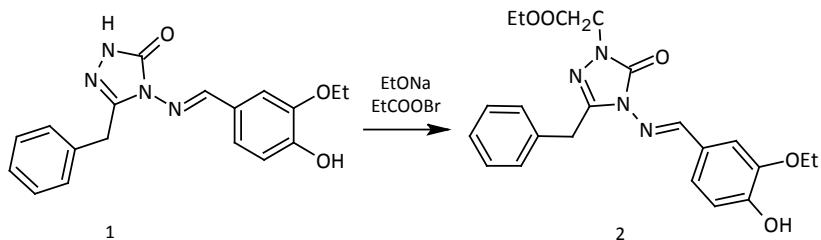
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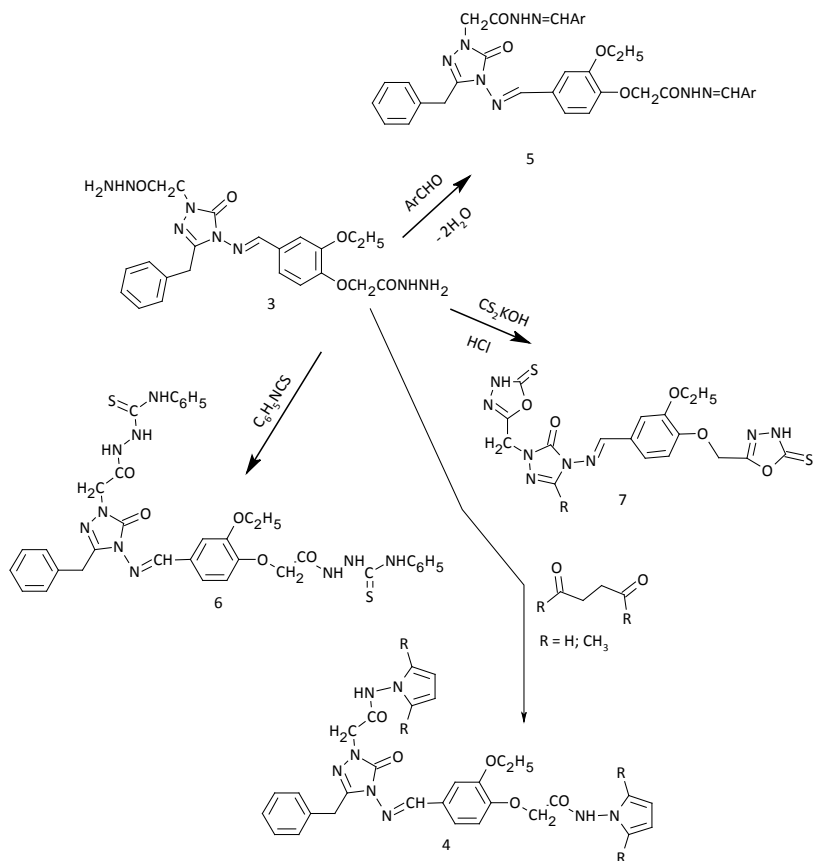
PP 112. **SYNTHESIS AND SOME REACTIONS OF NEW DIHYDRAZIDE
HAVING 4,5-DIHYDRO-1H-1,2,4-TRIAZOL-5-ONE RING**

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In this study, 1-hydrazinocarbonylmethyl-3-benzyl-4-(3-ethoxy-4-hydrazinocarbonylmethoxy)-benzylidenamino-4,5-dihydro-1H-1,2,4-triazol-5-one (3) was synthesized from the reaction of 1-ethoxycarbonylmethyl-3-benzyl-4-(3-ethoxy-4-ethoxycarbonylmethoxy-benzylidenamino-4,5-dihydro-1H-1,2,4-triazol-5-one (2), which was synthesized from compound 1 [1], with hydrazine hydrate [2] and its some reactions were investigated. For this purpose, first of all, from the reactions of compound 3 with 4-methoxybenzaldehyde, 4-hydroxybenzaldehyde, 3-hydroxy-4-methoxybenzaldehyde and salicylaldehyde, 5 type compounds were obtained. Besides, the reactions of compound 3 with acetonylacetone and 2,5-dimethoxytetrahydrofuran were also investigated. Thus, 4 type compounds called 1-[(2,5-dimethylpirrol-1-yl)aminocarbonylmethyl]-3-benzyl-4-[3-ethoxy-4-(2,5-dimethylpirrol-1-yl)-aminocarbonylmethoxybenzylidenamino]-4,5-dihydro-1H-1,2,4-triazol-5-one and 1-[(pirrol-1-yl)aminocarbonylmethyl]-3-benzyl-4-[3-ethoxy-4-(pirrol-1-yl)-aminocarbonylmethoxybenzylidenamino]-4,5-dihydro-1H-1,2,4-triazol-5-one were synthesized. In addition, from the reactions of compound 3 with phenylisothiocyanate and in the presence of potassium hydroxide with CS₂, 1-(phenylthioureido-carbamoylmethyl)-3-benzyl-4-[3-ethoxy-4-(phenylthioureido-carbamoylmethoxybenzylidenamino)-4,5-dihydro-1H-1,2,4-triazol-5-one (6) and 1-(4,5-dihydro-1,3,4-oxadiazole-5-thione-2-yl)methyl-3-benzyl-4-[3-ethoxy-4-(4,5-dihydro-1,3,4-oxadiazole-5-thione-2-yl)methoxy-benzyliden-amino]-4,5-dihydro-1H-1,2,4-triazol-5-one (7) were formed. Newly synthesized compounds have been characterized by elemental analyses, IR, ¹H NMR, ¹³C NMR and UV spectral data. Moreover, compounds synthesized were also screened for their antioxidant activities.





Acknowledgment. This study is supported by TUBITAK. Project Number : 108T984.

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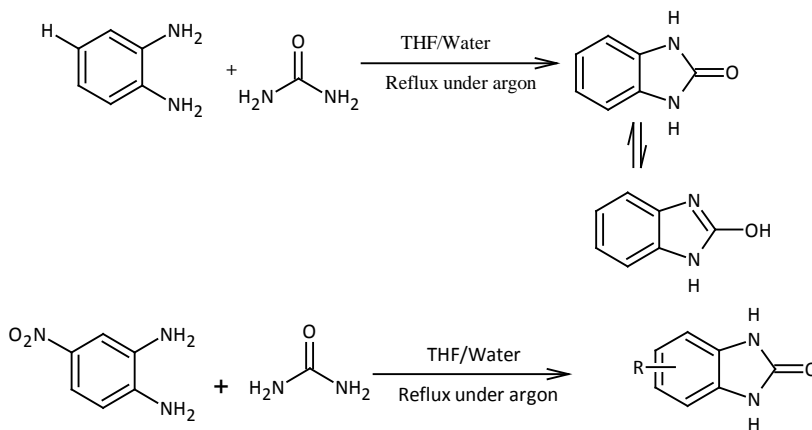
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PP 113. **A NEW EFFECTIVE AND CONVENIENT METHOD FOR THE PREPARATION OF 2(3H)-BENZIMIDAZOLONE AND ITS DERIVATIVE 5-NITRO-2(3H)-BENZIMIDAZOLONE WHICH ARE VERY USEFUL CYCLIC UREA HETEROCYCLIC BUILDING BLOCK OF INTERESTING BIOCHEMICAL AND PHARMACOLOGICAL ACTIVE COMPOUNDS**

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An easy and generalized route to synthesis a 2(3H)-benzimidazolone and 5-Nitro-2(3H)-benzimidazolone at a sufficiently high purity and yield, is attempted which is a class of cyclic urea derivatives demonstrating a wide variety of biochemical and pharmacological properties. A new effective and convenient method for the in situ generation and cyclization at 1, 2 position of phenylene diamine with reaction of urea and result in five member heterocyclic ring. All the synthesized compounds were characterized by modern spectroscopic techniques of the time.



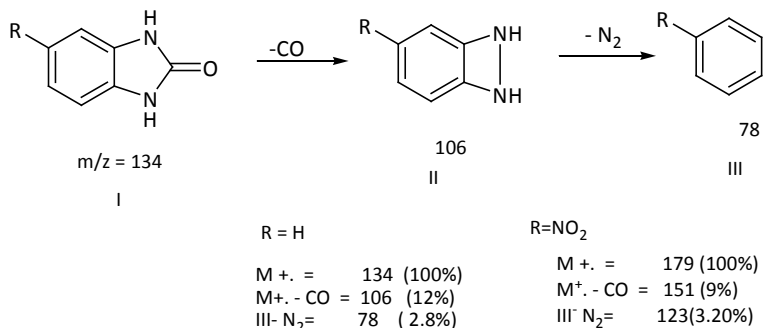
Scheme1: Synthesis of 2(3H)-benzimidazolone and 5-Nitro-2(3H)-benzimidazolone

Table 1: Physical data of 2(3H)-benzimidazolones and 5-Nitro-2(3H)-benzimidazolone

Compound	R ₁	R ₂	R ₃	% yield ^a	M.P, °C	
BIZ-H	H	H	H	93.7	310	
BIZ-NO ₂	H	NO ₂	H	87	306	

^a Yields after column chromatography

It was found that the spectroscopic studies were proved very helpful in elucidation of the products.



Scheme 2. Mass Fragmentation pattern of the 2(3H)-benzimidazolone and 5-nitro-2(3H)-benzimidazolone

Table 2. FT-IR spectral data of 2(3H)-benzimidazolones

Functional Group	$\nu \text{ cm}^{-1}$
-NCO stretching	1735
C-H aromatic vib	1110
C-H vib deformation	830-880
C=C aromatic vib	1385-1395
=C-H aromatic stretching	3182-3190
-NH free group	3250-3400
C=O overtone	3350-3400

Table 3. $^1\text{H-NMR}$ spectral data (DMSO) of 2(3H)-benzimidazolone

Proton	δ (ppm)	Multiplicity
H-1,3	10.7	2H, s
H-4,5,6,7	6.90	4H, s

Table 4. $^1\text{H-NMR}$ spectral data (DMSO) of 5-nitro-2(3H)-benzimidazolone

Proton	δ (ppm)	Multiplicity
H-1,3	10.7	2H, s
H-4	8.20	1H, dd
H-7	8.90	1H, d
H-4	8.85	1H, d

Acknowledgment:

Authors would like to thank and grateful to Higher Education commission of Pakistan for their financial support regarding this work under indigenous scholarship scheme.

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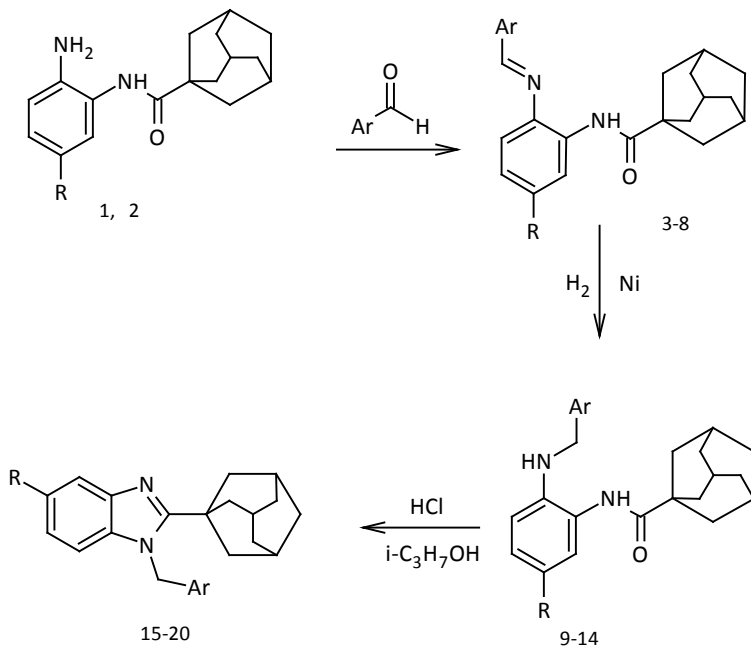
PP 114. **THE AROMATIC ALDEHYDES CONDENSATION WITH N-(1-ADAMANTOYLAMINO)-2-AMINOBENZENES AND THEIR SOME TRANSFORMATION**

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The adamantane and benzimidazole derivatives have antiviral, antibacterial, anticancer, anticataleptic, anthelmint and other activity [1-7]. Because of that investigation of adamantane containing benzimidazole's synthesis and studies of their pharmacological properties are perspective

For this aim were studied N-(1-adamantoyl)-2-aminobenzenes condensation with aromatic aldehydes, obtained Schiff's Bases catalytically reduction and cyclization according to the following scheme:



R=H, CH₃O; Ar= 2-OHC₆H₄; 2-OH-5-BrC₆H₃; 2-OH-3,5-BrC₆H₂

Condensation of N-(1-adamantoylamino)-2-aminobenzene (**1**) and 5-methoxy-N-(1-adamantoylamino)-2-aminobenzene (**2**) with salicylic, bromosalicylic and dibromosalicylic aldehyde were performed at 60-70 °C in absolute alcohol 2-5 hour boiling and were formed Schiff's Bases **3-8** (60-85%) of which catalytical reduction in alcohol or in ethyl acetate in the presence of Raney nickel in room temperature for 12-24 hour were obtained compound **9-14** in 53-62% yield. By cyclization aminoamide **9-14** in isopropyl-water (50% v/v) in the presence of concentrated HCl under refluxing for 14-16 hour were given N-alkyl -2-(1-adamantyl)benzimidazole (**15-20**) in 50-80% yield.

The structure of the products was confirmed by IR, UV, ^1H and ^{13}C NMR data.

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Acknowledgment: The designated project has been fulfilled by financial support of the Shota Rustaveli National Science Foundation (Grant #GNSF/ST08/4-413). We also want to thank the Deutsche Akademische Austauschdienst (DAAD) for supporting the partnership and the exchange program between the Ivane Javakhishvili Tbilisi State University and the Saarland University

PP 115. **METHOD FOR OBTAINING OF PREPARATION GZ-051
(ANALOGUE OF RAFOXANIDE) ITS BIOLOGICAL PROPERTIES**

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Sh. Samsoniya², Iu. Sadaterashvili¹, M. Kartvelishvili¹,
N. Nadiradze¹**

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Preparation rafoxanide (flukanide, ranid, MK-990) is one of the best fasciolocides. It is high effective in small doses, low toxic, very effective against imaginal and pre-imaginal stages of fasciola. It also affects nematodes [1,2]. The aim of our study was to develop a convenient method for obtaining preparation GZ-051 (rafoxanide's analogue) providing increased yield and quality of desired product, savings costs, and improved conditions of work. The method for producing GZ-051 allows us to obtain the desired product with high yield (76%) and high purity. The yield according to the US patent [3] is 58%.

Technical and economic advantages of the proposed method is an increased yield of the desired product, simple technological process - possible recovery of nitro product under pressure is excepted and there is no need to isolate an intermediate product toxic 3-Chloro-4-(4'-Chlorophenoxy) aniline in the free form. The advantage of our method is also that 2,4-dichloro-4'-nitrodiphenyloxyde can be reduced in a two-phase system consisting of an organic solvent and an aqueous solution of ammonium chloride.

Reduction reaction takes place in the boiling reaction mixture. Reductor is iron dust or reduced iron powder. As a result 3-chloro-4-(4'-chlorophenoxy)aniline is produced which in the form of the dried solution in aromatic hydrocarbon is treated with 3,5-diiodo salicylic acid after separation of an aqueous solution of ammonium chloride in the presence of PCl_3 and waterless ZnCl_2 , followed by separation of the desired product by known methods.

Parameters of acute toxicity of GZ-051 for white mice when injected into the stomach are: $\text{LD}_0=100$ mg/kg, $\text{LD}_{50}=187(153-248)$ mg/kg and $\text{LD}_{100}=400$ mg/kg. The drug is low-toxic, it belongs to a class 3 risk. Results of tests for anthelmintic effectiveness at fascioliasis showed that the preparation GZ-051 as effective as rafoxanide.

Use of the preparate showed efficiency 100% in doses 10 mg/kg in suspension form on starch paste and in doses of 15 mg/kg in suspension form and boluses at sheep' spontaneous fascioliasis. At the same time no deviations from the physiological norm in healed animals were observed. Antimicrobial activity of the preparate GZ-

051 in comparison with gentamicin is studied. High level of its activity is revealed against microorganisms Staph. 93, Staph. 119, Shig. Flexner, Klebsiella 4, Serracia 316.

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PP 116. **STUDY OF THE CONDENSATION REACTION OF 4-(1-ADAMANTYL)-1,2-DIAMINO BENZENE WITH AROMATIC ALDEHYDES AND CARBOXYLIC ACIDS**

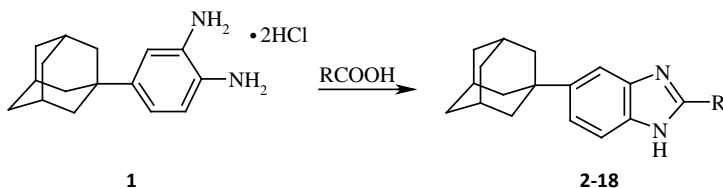
**M. Lomidze¹, D. Zurabishvili¹, I. Gogolashvili¹,
M. Trapaidze¹, U. Kazmaier², Sh. Samsoniya¹**

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Some preparations of the adamantane line such as kemantane, bromantane and others restore functional activity of neuron, hormone and immune systems, increase physical and mental activities. They are also resistance to viral and bacterial infections [1-4]. Among heterocyclic compounds benzimidazoles are of particular interest. Preparations created on their basis are widely used in medicine, veterinary and agriculture [5,6]. Thus, study of synthesis and pharmacological activity of 5(6)-(1-adamantyl)benzimidazole derivatives is perspective.

4-(1-adamantyl)-1,2-diaminobenzene's condensation with aliphatic and aromatic carboxylic acids were carried out and studied earlier by us [7,8]. The aim of the present work is to study condensation reaction of 4-(1-adamantyl)-1, 2-diaminobenzene's with some aromatic carboxylic acids and amino acid in the presence of POCl₃ and with aromatic aldehydes. The reaction goes according to the following scheme:



(2) R = H; (3) R = Me; (4) R = C₃H₇; (5) R = Ph; (6) R = CH₂Ph; (7) R = 1-Ad; (8) R = *o*-C₆H₄Cl; (9) R = *p*-C₆H₄Cl; (10) R = CH₂OPh; (11) R = *o*-C₆H₄OH; (12) R = 2-OH-3,5-Br₂C₆H₂; (13) R = 2-OH-3,5-I₂C₆H₂; (14) R = CH₂NH₂; (15) R = *m*-C₆H₅CONHC₆H₄; (16) R = CH₂NHCOC₆H₅; (17) R = CH₂NHCOCH₃; (18) R = CH₂CH₂COOH;

The basic properties of compound **1** were greater than *o*-phenylenediamine due to the electron-donor effects of an adamantyl radical and condensation reactions with aliphatic, aliphatic-aromatic acids go comparatively soft conditions with high yield. It is known [9] that heating *o*-phenylenediamine with adamantane-1-carboxylic acid at atmospheric pressure does not lead to cyclization to a benzimidazole whereas condensation of compound **1** gave the cyclization product **7** in 97% yield under the

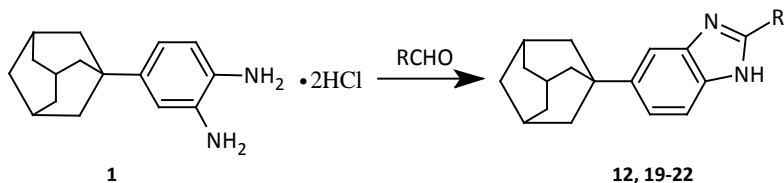
same conditions.

Condensation of compound 1 with benzoic-, salicylic-, o-chlorobenzoic- and p-chlorobenzoic acids occurs at high temperature, e.g. in the case of p-chlorobenzoic acid at 230-240 °C. Our attempt to form corresponding 12, 13 adamantylbenzimidazole by heating 4-(1-adamantyl)-1,2-diaminobenzene's dihydrochloride with dibromosalicylic and diiodosalicylic acids with ratios 1:5, 1:1, respectively, or with polyphosphoric acid (ppa) or polyphosphoric acid ester (ppe), had no results. Only heating of components under equimolar ratio in the presence of POCl₃ gets corresponding adamantylbenzimidazole 12, 13.

It was also carried out condensation of 4-(1-adamantyl)-1,2-diaminobenzene's dihydrochloride with α-aminoacetic acid, 3-benzoylamino benzoic acid and N-benzoylaminoacetic acid in the presence of POCl₃. Corresponding adamantylbenzimidazoles 14-16 were isolated. Compound 16 was also synthesized by counter synthesis - by reacting between compound 14 and benzoyl chloride in the presence of TEA in the absolute ether medium.

As a result of condensation of 4-(1-adamantyl)-1,2-diaminobenzene's dihydrochloride's with N-acetylglycine and amber acid corresponding benzimidazoles 17 and 18 are put out. Corresponding aminobenzimidazole 14 was got soaping compound 17 in the alkaline ethanol.

Condensation reactions of 4-(1-adamantyl)-1,2-diaminobenzene dihydrochloride with aromatic aldehydes (3,5-dibromosalicylic-, 5-bromosalicylic-, 3-nitrobenzaldehyde and p-diethylaminobenzaldehyde) was studied. After boiling of the mentioned reagents with a equimolar ratio in absolute ethanol and oxidation of Schiff's Bases got in nitrobenzene medium while boiling corresponding adamantyl-benzimidazoles 12, 19-22 were isolated.



(12) R=2-OH-3, 5-Br₂C₆H₂. (19) R=2-OH-5-Br-C₆H₃. (20) R=2-OH-5-NO₂-C₆H₃. (21) R= 3-NO₂-C₆H₄. (22) R=p-C₆H₄NEt₂.

The structure of the products was confirmed by IR, ¹H and ¹³C NMR data.

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PP 118. **SYNTHESIS AND SOME TRANSFORMATION OF
N-(1-ADAMANTOYL)AMINOBENZENE**

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N. Samsonia, D. Zurabishvili, M. Trapaidze**

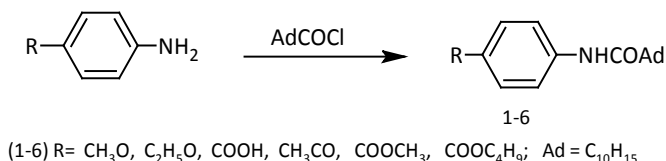
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Identification of antiviral activity of aminoadamantane has assumed as a basis for advance to adamantane's chemistry and for research to wide spectrum's having new pharmacological preparations.

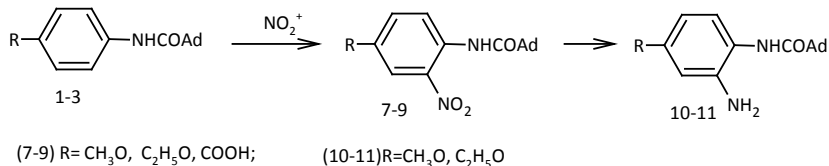
Today more than two dozens adamantane containing medical drugs is created. Some perspective preparations were under clinical test in order to study their antiviral, anti bacterial, antiparkinsonian, adaptogenic, anticancer, immunostimulative, etc. properties [1–5].

The aim of our current work were to study the adamantoyllation of amino benzene derivatives, nitration reaction of N-(1-adamantoyl)aminobenzene, obtained compounds catalytically reduction and cyclization.

Were carried out condensation of p-aminobenzoic acid and their ester, p-aminoacetophenone, 1-alkoxy-4-aminobenzene derivatives with adamantane-1-carbonyl chloride in presence of basis agent (NaOH, TEA) in aromatic solvent and in ether sphere.



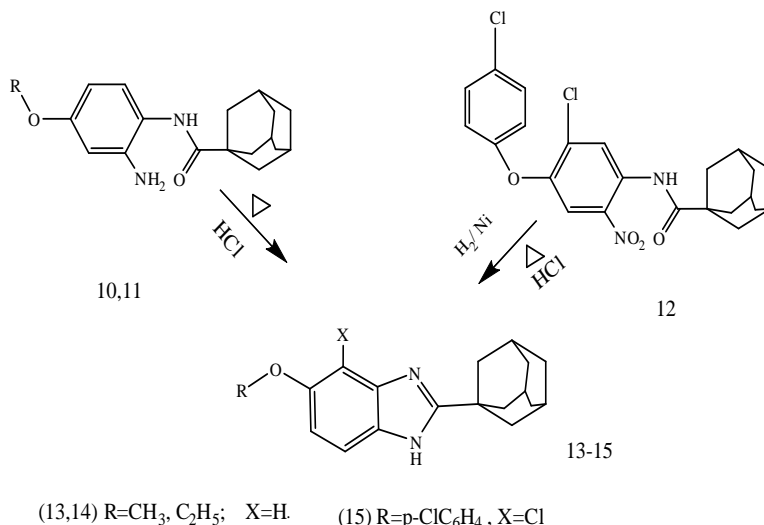
Were performed synthesized amides **1-3** nitration's and reduction's reaction.



Were studied nitration reaction in room temperature by using 57% HNO₃ in acetic

acid and catalytically reduction of nitroamides with molecular hydrogen in alcohol or in ethylacetate in the presence of Raney nickel in room temperature.

Synthesis of 2-(1-adamantyl)benzimidazoles were performed according to following scheme:



Cyclization of aminoamides **10**, **11** were carried out in concentrated HCl in boiling EtOH/water (50%v/v) under refluxing. Synthesis of compound **15** were performed by reduction corresponding nitro product **12** and then their cyclization without their isolation in the same condition.

Virtual bio-screening of synthesized compounds **1-15** was made by using internet program <http://www.pharmaexpert.ru>. It is possible that obtained compounds in high probability will be discovery following activity in (Pa=0.70-0.92) Antiviral (Arbovirus, Influenza, Picornavirus, Adenovirus, HIV); Antiasthmatic; Antiallergic; Radioprotector; Anesthetic local; Antiepileptic, Antineoplastic (brain cancer); Transferase stimulant, Antibacterial, Anthelmintic; Neurotrophic factor enhancer and others.

The structure of the products was confirmed by IR, UV, ^1H and ^{13}C NMR data.

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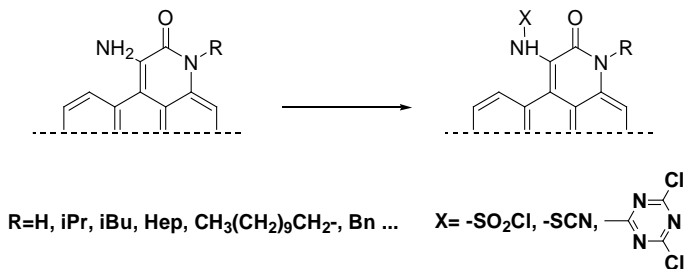
PP 119. THE NOVEL PYRIDONE CONTAINING FLUORESCENT PROBES
WITH DIFFERENT REACTIVE GROUPS

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Pyridone containing compounds are widely used fluorophores with unique physical-chemical properties that are applied in various chemical, technical and biomedical techniques. Their application in microbiology and histology as a fluorescent probes is also important [1, 2].

In the present work we developed convenient methods for one-pot-synthesis of novel mono and bis-pyridone moiety containing active dyes with different reactive groups such as chlorosulfonyl, dichlorotriazinyl and thiocyanate groups. The physical, optical and chemical properties of obtained compounds have been also studied.



Scheme 1. Synthesis of active fluorescent dyes

Chlorosulfonation of pyridone-containing fluorescent dyes has been carried out in the chlorosulfonic acid media (reagent and solvent) at 60 °C for a period of 3 h. The reaction mass was transferred onto crushed ice and precipitated yellow-light brown crystals were isolated with filtration. Interaction between pyridones and cyanuric chloride have been carried out in the weak alkali-weak acid suspension at 0-5 °C for a period of 7-8 h and desired product were filtered off [1, 2]. The synthesis of thiocyanate moiety containing active dyes means the reaction between a solution of pyridone compound and ammonium thiocyanate in the glacial acetic acid and bromine at 15-20 °C for a period of 1-1.5 h. The reaction mixture was poured into water and precipitated light brown crystals were separated via filtration [3].

The synthesized active dyes may be used as fluorescent probes. Namely, they are able to stain trace amount of proteins. It has been found, that staining process with chlorosulfonyl derivatives runs in the weak alkali media (pH 7.5-8.5) at 0-4 °C while dichlorotriazinyl derivatives reacts at 20-75 °C in the weak acid media (pH 5.6-5.8) and thiocyanate derivatives - in the water-acetone solution in alkali media (pH 9.0) at the room temperature. The labeled proteins, obtained according to above mentioned methods, have yellow color with green luminescence [1-3].

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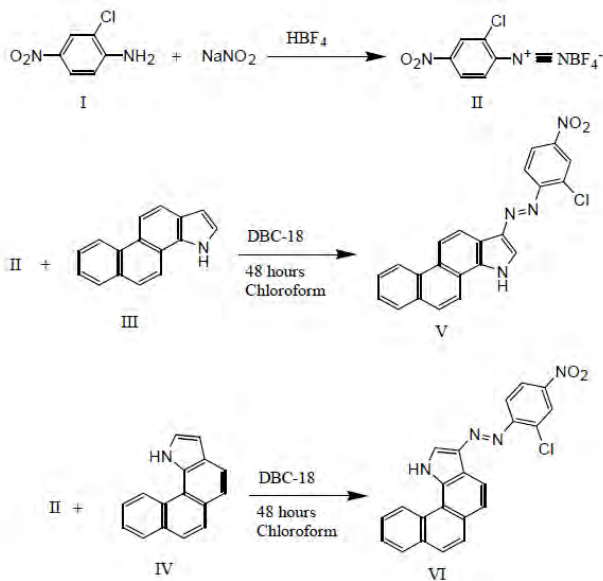
PP 120. **ENVIRONMENTALLY FRIENDLY NAPHTHOTOINDOLE CONTAINING
AZO DYES**

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Azo dyes are used in a variety of industries, including textile, cosmetics, food, leather and paper industries. However, some azo compounds manifest carcinogenicity due to the high reactivity of their metabolic intermediates and can react covalently with DNA and cause mutations [1-3]. The possible way to avoid such reactive carcinogenic metabolic compounds is the synthesis of azo dyes from biologically active components. As it is known, most indole containing compounds are characterized with such property. For instance, naphtho[1,2-g]- and naphtho[2,1-g]indole were proposed to have a tubercular static activity [4, 5]. On the other hand some halogenated azo compounds (i.e. 2',6'-dichloro-4-dimethylaminoazobenzene and others) have the greatest enhancement of the AhR ligand activity and are a good receptors of dioxine [6, 7]. Here we report the synthesis of new (E)-1-(2-chloro-4-nitrophenyl)-2-(3H-naphtho[1,2-g]indol-1-yl)diazene and (E)-1-(2-chloro-4-nitrophenyl)-2-(1H-naphtho[2,1-g]indol-3-yl)diazene azo dyes from of biologically active components 2-chloro-4-nitroaniline (I) and naphtho[1,2-g]indole (III) or naphtho[2,1-g]indole (IV), and their spectral and physical-chemical characteristics (scheme 1). In addition, the quantum-chemical calculations have been performed using quantum mechanical (MM2) and semi-empirical (AM1) methods. These calculations are valuable for providing insight into the structure-activity correlation, and are useful for the prediction of the toxicity of some structurally related compounds.

2-chloro-4-nitrophenyldiazonium tetrafluoroborate (II) has low solubility in the water and is insoluble in the non-polar organic aprotic solvents (i.e. chloroform). In order to achieve its solubilization in the chloroform dibenzo-18-crown-6 as a phase transfer catalyst was employed. Azo coupling reaction between II and III (or IV) has been carried out for a period of 48 hours with efficient stirring. After filtration, evaporation of solvent and purification resulted dyes 5 and 6 with absorption maxima of 430 and 470 nm respectively, were isolated in 35-37% yield as orange crystalline solids. These compounds if employed for dyeing the polymeric matrixes and hydrophobic fibers give intense yellow and orange color. The colored materials are characterized with good light-fastness and fastness against wet treatment.



Scheme 1. Synthesis of azo dyes V and VI

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PP 121. **TUNING SENSITIVITY OF CHROMOPHORIC RECEPTORS FOR
CHIRALITY DETERMINATION**

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³ Michigan State University, USA

Developing and establishing reliable spectroscopic methods for chirality determination cannot be overstated, since the chirality is a common component of synthetic building blocks, biological active natural compounds, and synthetic materials. Exciton-Coupled Circular Dichroism (ECCD) is a non-empirical approach to chirality determination. [1] It is based on detecting the exciton interaction between two or more non-conjugated chirally-oriented chromophores. Helical arrangement of chromophores is detected by CD spectrometer as a bisignate CD curve, and the sign of the curve relates to the helical disposition of chromophores. Thus, a clockwise orientation of chromophores yields a positive ECCD spectrum and a negative spectrum is observed for a counterclockwise arrangement. Introduction of chromophores onto the molecule of interest can be carried out either through covalent modification, or non-covalent complexation.

Porphyrin tweezers are bis-chromophoric hosts that consist of two zinc porphyrins connected through a flexible linker. [2] Zinc metal incorporated into the porphyrin core allows for non-covalent complexation of chiral guest thus eliminating the necessity of chemical modification of chiral molecule with chromophores. Tweezers were successfully utilized in determining the absolute stereochemistry of various chiral substrates, including diamines, amino alcohols and amino acids, [2] monoamines and monoalcohols, [3,4] carboxylic acids, [5,6] and the working mnemonics derived for each class of substrates allows for easy correlation of the observed ECCD with the helicity of the complex and chirality of the bound chiral guest.

Chirality sensing in the tweezer-substrate complex is driven by the steric interaction between the porphyrin and the substituents at the chiral center. We have evaluated the role of this steric interaction by constructing a series of porphyrin tweezers of varied steric bulk. After complexation of these hosts with chiral diamines and carboxylic acids a distinct effect of sterics on ECCD magnitude and sign were observed. Thus, complexes of more conformationally rigid diamines benefited from the sterics introduced onto the ortho-position of the peripheral phenyl rings of the porphyrin (ZnTMsP tweezer). In contrast, diminished ECCD magnitudes are observed with ZnTMsP tweezer and chiral amides. Further tweezer modifications showed that up to 10-fold increase in ECCD magnitude can be achieved upon functionalization of meta-position of the peripheral phenyl rings (ZnTBP tweezer).

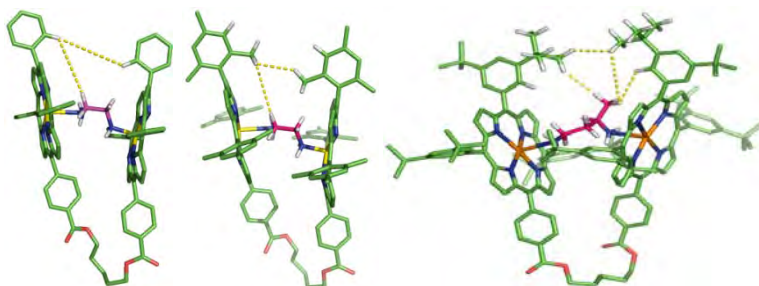


Figure 1: Porphyrin tweezer complexes with diamines (molecular mechanics minimized MMFF94, Spartan). Increased steric interaction is observed with modification of the tweezer with t-butyls.

In addition to steric interactions tweezer sensitivity can be improved by enhancing its coordinative properties. While conventional ZnTPP porphyrin binds effectively electron-rich functionalities such as amino or amide groups, oxygen functionalities are classified as weak binders. This represented a significant limitation to the use of tweezer method as conventional chirality determination analysis. Hence, in pursuit of a stronger binder we have synthesized several porphyrin tweezers bearing electron-donating or electron withdrawing groups. As a result, we observed that pumping electrons into the porphyrin from electron-donating substituents diminished tweezer binding, while introduction of electronwithdrawing groups enhanced coordinative properties of Zn. Thus, a new tweezer with improved coordinative properties was designed and synthesized. ZnTPFP-tweezer bears pentafluorophenyl groups at the meso-positions of the porphyrin and exhibits significant binding towards alcohols. With development of this new host, we were able to apply ECCD analysis to stereochemical determination of chiral 1,2-diols [7] and 2,3-epoxyalcohols[8], and are currently expanding the scope of substrates.

In conclusion, use of chromophoric hosts allows for fast and easy microscale analysis of various classes of organic compounds. Further investigations directed towards robust and reliable chromophoric hosts for chirality determination are also underway and will be reported in due time.

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PP 122. **THE SYNTHESIS OF NEW HETEROCYCLIC SYSTEMS, CONTAINING
BENZOTRIAZOLE**

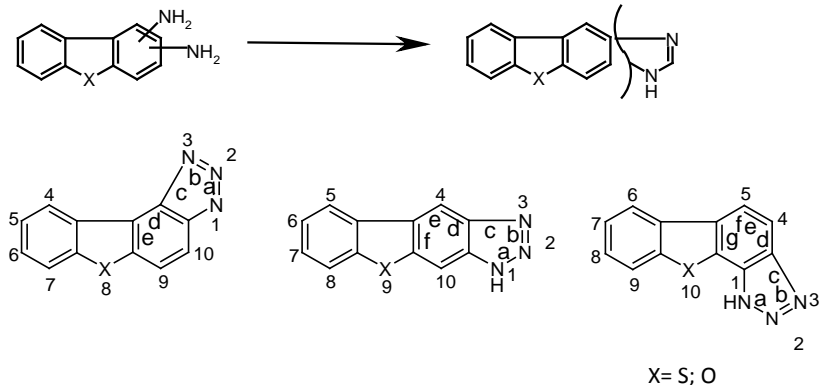
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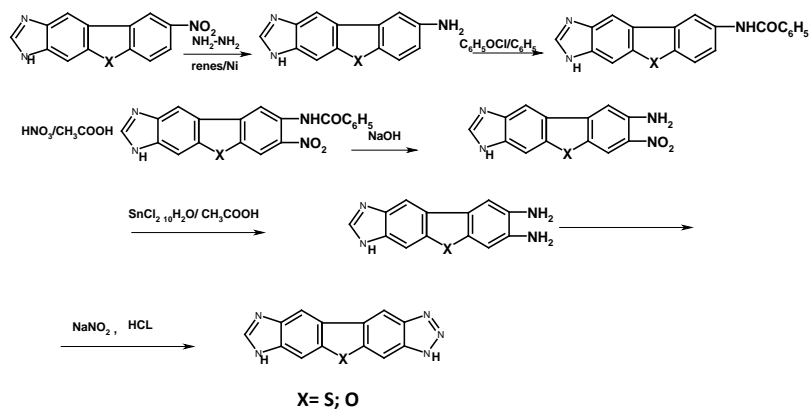
The goal of the work is to create condensed heterocyclic systems, which contain two bicyclic fragments: benzotriazole and benzo(b)thiophene/furane, each component has high biological activity.

Nowadays triazoles and its derivatives are more and more actual. Amino triazoles are used in medicine and photography. On the base of triazoles are obtained herbicides of high activity and fungicides. It's determined, that the most of triazoles class representatives have high biological activity. That's why they are useful to produce new medicines and substances for plant protection [1].

The initial substances were o-diamines of all possible configuration of dibenzothiophene and dibenzofurane. By cyclisation of these substances with sodium nitrite in acid area, were obtained the respective benzo(b)thiophene/furanebenzotriazoles [2].



At the same time, we regard as the subject of our interest to obtain heterocyclic systems, including as imidazole and triazole, also dibenzothiophene/dibenzofurane. At the first phase we've taken benzo(b)thiophene/furane-benzimidazole, by nitrisation of these substances, reduction and nitrisation again and reduction. By treatment o-diamines of benzo(b)thiophen/furane benzimidazole of diamines with sodium nitrite in acid area, we've got the condensed pentacyclic systems, containing benzimidazole and triazole.



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PP 123. **QUANTUM-CHEMICAL STUDY OF THE SOLVENT EFFECT ON
ABILITY OF FORMAMIDE AND N-METHYLSUBSTITUENT
FORMAMIDES OF COMPLEXES WITH METAL FORMATION**

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The solvent effect on ability of formation of complexes with metal of formamide (1), N-methylformamide (2) and N,N-dimethylformamide (3) is studied By means of the quantum-chemical semiempirical method AM1. It is shown that the solvents cause increase of stability and dipole moments of the investigated formamides. The population of 2s-orbitals of atoms of oxygen and nitrogen depending on influence of the solvent does not change. On the other hand, 2s-orbitals of atoms of oxygen are characterized by high population and its ability is accordingly great to form complexes with metals. Hexane as a solvent promotes a favorable spatial condition of C=O group for formation of complexes with metals.

It is known that solvents influence the ability of ligands to form complexes with metals. With the purpose of studying of the solvent influence on the ability of formamide (1), N-methylformamide (2) and N,N-dimethylformamide (3) of a complex with metal formation by means of the semiempirical quantum-chemical method AM1[1] the energetic, electronic and structural characteristics in gas phase and different solvents are calculated.



1) $R^1 = R^2 = H$; 2) $R^1 = H, R^2 = CH_3$; 3) $R^1 = R^2 = CH_3$.

The heat of formation (ΔH) of these formamides (1-3) in the solvents in comparison with gas phase considerably decreases. Hence, the solvent stabilizes formamides, especially in a water solution. The solvent also increases the dipole moment (η) of all formamides, which is explained by the appearance of an additional dipole moment, stimulated by the solvent.

The solvent causes an increase of the charge on atom of oxygen (q_o) and the maximal value is observed for water. On the other hand, the methyl group causes reduction of value of q_o . In particular,

$q_o(1) = -0.643$, $q_o(2) = -0.615$ (Table 2) and $q_o(3) = -0.588$.

Contrary to the atom of oxygen the charge on atom of nitrogen (q_N) decreases

under the influence of the solvent, and the maximal value q_N is observed in hexane. The methyl groups in this case cause reduction of charge q_N . In particular, $q_N(1) = -0.439$, $q_N(2) = -0.393$ and $q_N(3) = -0.345$.

From the analysis of populations of atomic orbitals it is seen, that in the investigated formamides the population of 2s-orbital of oxygen and nitrogen atoms depending on influence of the solvent does not change. $2s(O) = 1.916$, and $2s-[N(1)] = 1.457$, $2s-[N(2)] = 1.464$ and $2s-[N(3)] = 1.471$. Hence, the methyl groups cause increase of the population 2s-orbital of nitrogen atoms. 2s-orbital of oxygen atom is characterized by high population in comparison with nitrogen atom and its ability to form complexes with metals is accordingly great.

The solvent causes reduction of orders of carbonyl group (P_{CO}) and value meaning is observed for water solution. In particular, $P_{CO}(1) = 1.519$, $P_{CO}(2) = 1.519$ and $P_{CO}(3) = 1.581$. On the other hand, the length of carbonyl group (R_{CO}) increases at transition from gas phase to solvent and the maximal values is observed in water and dimethylsulfoxide. In particular, $R_{CO}(1) = 1.271$, $R_{CO}(2) = 1.267$ and $R_{CO}(3) = 1.264$. Considering that reduction of orders and increase of the length of bonds cause an increase of its reactivity it may be assumed that the highest reactivity of carbonyl group is characteristic of formamide (1). It means that methyl groups reduces the reactivity of the carbonyl group. Besides, in formamide (1) solvent causes increase of C-N bond orders (P_{CN}), which has maximal value in water.- [$P_{CN}(1) = 1.323$]. We have the same value for N-methylformamide (2), and N,N-dimethylformamide (3) $P_{CN}(1) = 1.217$. On the other hand, in formamide (1) the lengths of C-N bond in water – $R_{CN}(1) = 1.361\text{\AA}$, in N-methylformamide (2) $R_{CN}(1) = 1.368\text{\AA}$ and in N,N-dimethylformamide (3) $R_{CN}(3) = 1.375\text{\AA}$. According to the above discussion of bond reactivity, based on these values, the C-N bond shows high reaction capacity in the water solution of N,N-dimethylformamide. It means that the methyl group in formamides promotes an increase of reactivity. The solvent causes also reduction of HCO and NCO valence angles and the maximum of these angles is reached in hexane. Hence, hexane promotes favorable spatial order of C=O group for the formation of complexes with metals.

Thus, analysis of changes of the energetic, electronic and structural characteristics of formamide (1), N-methylformamide (2) and N,N-dimethylformamide (3), as a result of influence of the solvent enables a quantitative description of their ability of formation of complexes with the metals studied.

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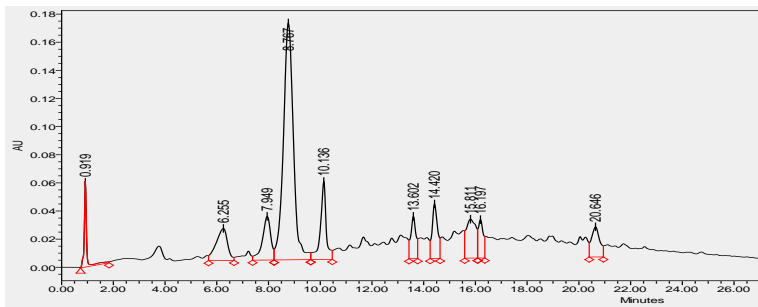
PP 124. HETEROCYCLIC COMPOUNDS RESEARCH BY HPLC

M. Vanidze, A. Kalandia

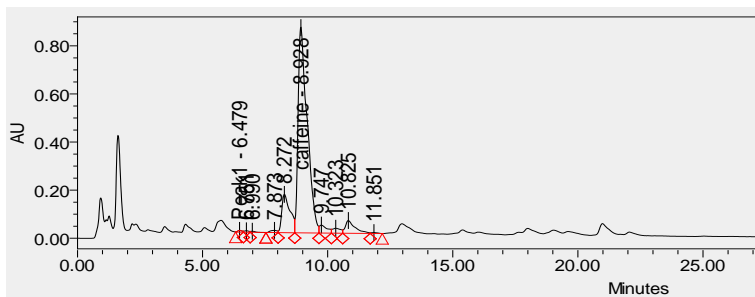
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Raw materials are used to get many food and drugs. Unfortunately, in many cases the sale of products in natural products are modified with various artificial components, which are characteristic of true taste and aroma to the product, but it did not contain biologically active compounds for natural products, it does not function at all.

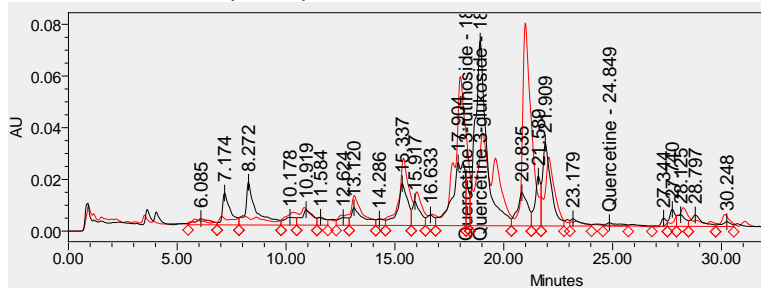
The counterfeiting of products is available on the product features heterocyclic compounds studies (the addition of synthetic compounds are the economically unacceptable for falsifier). Juice (especially red) industry does wrong using nonantocian pigments. Similar cases are in wine falsifier. Also they do wrong with tea, but it is possible to identify fraud quickly and effectively some heterocyclic compounds by HPLC methods. Chromatographic by gradient chromatographs - Waters (USA), uv/visible Detector 2489, Binary HPLC Pump 1525, chromatogram column - Symmetry C18, detection flavonoids-360;370 nm, caffeine 280 nm, Anthocyanins 510-524 nm. moving phase 5 % formic acid (A) and Metanol (B), water: formic acid: Acetonitrile (87:10:3 (A) and water: formic acid: Acetonitrile (40:10:50 (B) solvent speed 0.8-1 ml/min, linear gradient, Study design A total of 20 μ l. Study design A total of 20 points. Been studied by many local (including) indigenous plant heterocyclic bioactive compounds (Anthocyanine, Flavonolic glycosides, Katechins, Caffeine ether), which can be used to discover falsifier.



Pic.1. Wine Saperavi Anthocyanins HPLC (518 nm)



Pic. 2. Tea Caffeine HPLC (280 nm)



Pic.3. Tea Flavonoids glycosides HPLC (370 nm)

References

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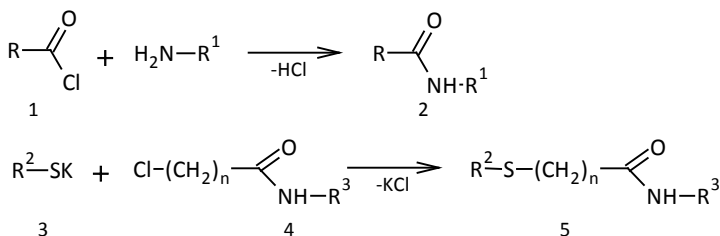
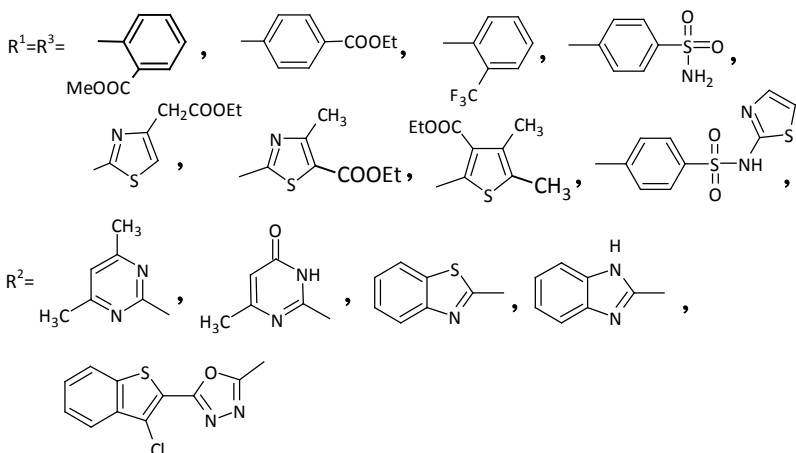
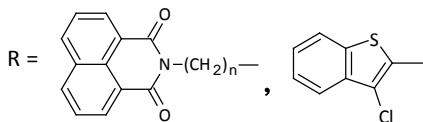
Acknowledgment. The designated project has been fulfilled by financial support of the Georgia National Science Foundation (Grant #GNSF/ST08/8-513). Any idea in this publication is possessed by the author and may not represent the opinion of the Georgia National Science Foundation

PP 125. SYNTHESIS OF NEW DERIVATIVES ACETAMIDES

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We have perfected a method of obtaining derivatives of acetamides chloride and an amine or heterocyclic aromatic nature. With high yields (70-87%) obtained substitution products **2**. As deputies, in an acid chloride were used derivatives of the drug "Izodibut", which for this purpose have been specifically synthesis.

 $n=2,3,5.$ 

Also provides a method of alkylation products **5** potassium salts prepared synthons **4**. This approach makes it possible to get acetamides derivatives **5** with different carbon chain lengths and allows you to create large combinatorial libraries of novel compounds based on them.

For compounds **2**, **5** partially conducted biological screening identified compound leaders. At this point, held a number of biological studies such acetamides derivatives.

PP 126. **HETEROCYCLIC COMPOUNDS OF USED PETROLEUM OIL AND
METHODS OF THEIR PRECIPITATION**

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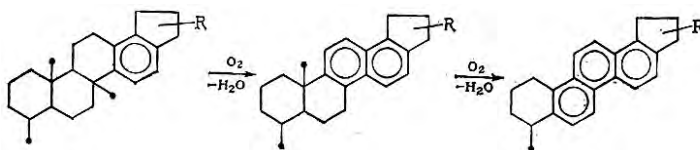
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Used motor oil is a complex dispersive emulsion, frequently containing fine dispersing mechanical additives that complicate a process of oil detention and filtration. Such kind of oil in fact becomes non-filtered due to the fact that long operation of oil results in production of dark black coloured rust products – asphaltene – resinous compounds.

Resins – are dark brown viscous amorphous substances. The gravity is less than 1, molecular weight fluctuates within 700 – 1000 a.u. They are non stable and easily mix with asphaltenes. Asphaltenes- are dark black molecular substances. The gravity is more than 1, molecular weight varies within 2000-14000 a.u. When exposed to high temperature (300 °C) asphaltenes change into plastic state and at even higher temperature coke is produced.

Asphaltene-resin compounds are produced as a result of rusting oil, naphtenes and aromatic hydrocarbons, that belong to heterocyclic compounds and they appear in used oil as heterocyclic fragments.



Asphaltenes

Effective synthetic arcotrim – carboxymethyl cellulose, sodium silicate, starch indicator solution, etc were used. In non-filtered used oil as coagulants. The process of oil coagulation is depended on the following technological parameters:

1. Amount of added reagents
2. Concentration of reagents
3. Length of contact between reagents and oil
4. Temperature
5. Other favourable circumstances (slicing, stirring)

For the selection of extragents certain amount of organic and mineral acid compounds were used in various correlation (1-2). Technological mode and parameters

were defined (table 1).

Table 1. Technological modes for treating used oil with extragents

Name of extragents	Temperature $T^{\circ}\text{C}$,	Correlation between oil and extragent, ml	Time, Minute	Efficiency %
Extragent -I	20	60 : 2	20	65
Extragent -II	130	100 : 3	6-8hours	80
Extragent -III	20	600 : 20	30	75

The research has shown that separate technological operations do not provide maximum treatment of oil to bring it to the condition of goods. Therefore, it is recommended to treat used oil in stages applying all technological operations. However, we should emphasize treatment of used oil using extractive method, which provides effective treatment from rusting products and also ensures maintenance of viscosity comparing with other methods.

Annotation. Presents asphaltenes-resinous compounds produced in used oil; their types and structures; treatment method of used motor oil and findings.

PP 127. **HYDROSILYLATION REACTION OF TETRAHYDROTETRAMETHYLCYCLOTETRASILOXANE WITH ALLYL BUTYRATE AND VINYLTRIETHOXSILANE**

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The polysiloxanes with very low glass transition temperatures $T_g = -123^\circ\text{C}$ for poly-(dimethylsiloxane), extremely high free volumes and a high segmental mobility are expected to be good hosts for Li^+ transport. Another necessary condition for high ionic conductivity is a high salt solubility in the polymer, which is most often achieved by donors such as etheric oxygen or esteric carbonyl groups on the main chain or on the side groups. Polysiloxanes are the excellent candidates for usage in solid polymer electrolytes because of their high chain flexibility, chemical stability, high thermal/oxidative stability, low toxicity, easy processability and low cost. So synthesis of new siliconorganic compounds and new polymers on their basis is issue of the day.

For the purpose of synthesis of methylsiloxane polymers with esteric side groups in the side chain the hydrosilylation reaction of 2.4.6.8-tetrahydro-2.4.6.8-tetramethylcyclotetrasiloxane (D_4^{H}) with allyl butyrate in the presence of platinum catalysts (platinum hydrochloric acid, Karstedt's catalysts and Pt/C at various temperature have been carried out in melt condition and in toluene solution.

Preliminary heating of initial compounds in the temperature range of $60\div 90^\circ\text{C}$ in the presence of catalyst, showed that in these conditions polymerization of 2.4.6.8-tetrahydro-2.4.6.8-tetramethylcyclotetrasiloxane, or allyl butyrate, break in siloxane backbone, or elimination of methane do not take place. Besides, there are no changes in the NMR and FTIR spectra of allyl butyrate and 2.4.6.8-tetrahydro-2.4.6.8-tetramethylcyclotetrasiloxane. By gas-liquid chromatography it was established that the polymerization of allyl butyrate and 2.4.6.8-tetrahydro-2.4.6.8-tetramethylcyclotetrasiloxane in this condition does not proceed.

It was established that hydrosilylation reaction of D_4^{H} with allyl butyrate proceeds vigorously at the beginning stages first 3-7 minutes. It was found that in hydrosilylation reactions the used catalysts show approximately the same reactionability.

By FTIR investigation it was shown that during hydrosilylation regrouping processes takes place and 2.4.6-tris(propyloxybutyrate)-8-hydroxy-2.4.6.8-tetramethylcyclotetrasiloxane (I) is obtained. Hydrosilylation reaction of 2.4.6.8-tetrahydro-2.4.6.8-tetramethylcyclotetrasiloxane (D_4^{H}) with allyl butyrate and vinyltriethoxysilane at 1:3:1 ratio of initial products proceeds with obtaining of 2.4-bis(propyloxybutyrate)-

6-ethyltriethoxy-8-hydroxy-2.4.6.8-tetramethylcyclotetrasiloxane (II). The composition and structure of hydroxyl containing organocyclotetrasiloxanes were proved by determination of molecular masses, by elemental analyses, by FTIR, ^1H , ^{13}C and ^{29}Si NMR spectra data. In the FTIR spectra of synthesized D_4^{R} and $\text{D}_4^{\text{RR'}}$ one can observe absorption bands at $3100\text{--}3600\text{ cm}^{-1}$ characteristic for hydroxyl groups, the absorption bands at 1080 cm^{-1} characteristic for valence oscillations of $\equiv\text{Si-O-Si}\equiv$ groups characteristic for cyclotetrasiloxane rings, there are no absorption bands for $\equiv\text{Si-H}$ bonds. So by us it was shown that in melt condition hydrosilylation reactions of D_4^{H} to allyl and vinyl monomers at high temperatures proceeds very active with secondary reactions with obtaining hydroxyl containing compounds.

For obtaining fully substituted cyclotetrasiloxanes we have investigated hydrosilylation reactions of D_4^{H} with allyl butyrate in absolute toluene solution in $30\text{--}50\text{ }^\circ\text{C}$ temperature range. During the hydride addition reactions, the changes of active $\equiv\text{Si-H}$ bonds' concentrations in time were observed. It was established that during hydrosilylation reaction D_4^{H} with allyl butyrate and vinyltriethoxysilane in solution fully substituted compound without any secondary reactions are obtained.

The kinetic parameters, rate constants and activation energy of hydrosilylation reactions D_4^{H} with allyl butyrate in melt condition and in solution have been calculated.

PP 128. **INVESTIGATION OF KINETIC PARAMETERS OF POLYMERIZATION REACTIONS OF PROPYL BUTYRATE AND ETHYLTRIETHOXYSILOANE GROUPS CONTAINING METHYLCYCLO-TETRA-SILOXANES**

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The wide application of organosilicon polymers in many fields of techniques pushed the development of organosilicon chemistry and increased application-oriented researches in above mentioned field. Interests in polymer electrolytes from the standpoints of application and fundamentals has led to search for synthesis of new methylorganocyclosiloxanes and polymers on their basis with short side chain ethers groups attached to polysiloxane exhibit high segmental mobility, and they do not display a significant increase in T_g as salt content is increased in polyelectrolyte.

As it is known from above mentioned literature data polymer electrolytes are obtained via hydrosilylation reaction of methylhydrosiloxane with allyl or vinyl containing organic compounds in the presence of catalyst. It must denote that the reaction at this time proceeds in the time with obtaining of various linking systems and often cross linking, and branching processes take place, which is undesirable technologically.

In this presented work we report the synthesis of new polysiloxane having propylbutyrate as an electro donor side group, ethyltriethoxysilane and hydroxyl group as cross-linkers.

In ring opening Copolymerization reaction as an initial compounds 2.4.6-tris(propylbutyrate)-8-ethyltriethoxysilane-2.4.6.8-tetramethylcyclotetrasiloxane (I) and hexamethyldisiloxane (II), have been used. Copolymerization reactions in the presence of catalysts (0.01-0.005% of total mass) alkali fluorides (KF, LiF and CaF_2) and tetramethyl ammonium hydroxide have been carried out in inert atmosphere, in melt condition in temperature range 50-120 °C and in toluene solution at 50-110 °C. By gas-liquid chromatography (GLC) it was established that alkali fluorides in this condition does not promote obtaining of polymers and only 25-30% of initial compounds take place in ring opening polymerization in case of KF. So the yield of polymers is very low.

Studying of catalytic activity of various ionic fluorides in relation of polymerization of organocyclotetrasiloxanes has shown that activity, decreases in a line: $\text{CaF}_2 < \text{LiF} < \text{KF}$. So this type of catalysts is not convenient for polymerization of these types of organocyclotetrasiloxanes.

Copolymerization reaction of compounds I and II have been studied in inert atmosphere, in toluene solution in temperature range 40-60°C in the presence of powder-like anhydrous potassium hydroxide (0.05 - 0.01% of total mass).

It was established that ring-opening polymerization in the presence of potassium hydroxide proceeds during 48-60 h. To study kinetic investigation by decrease of amount of initial organocyclosiloxane using gas-liquid chromatography it was shown that with an increase of temperature polymerization rate rises. The optimal condition of polymerization reaction has been determined and it was established that it's better to carry out the polymerization reactions in solution in temperature range 50-60°C. The kinetic parameters: reaction order, rate constants and activation energy of copolymerization reaction has been determined.

The synthesized polymers are vitreous viscous products, which are well soluble in organic solvents with the specific viscosity $\eta_{sp} \approx 0.035 - 0.2$. Structures and compositions of the polymers were determined by elemental and functional analyses, FTIR, ^1H , ^{13}C and ^{29}Si NMR spectral data. WAX and DSC analyzes of polymers has been studied.

Via sol-gel processes with $\text{CF}_3\text{SO}_3\text{Li}$ (5-20%) solid polymer electrolyte membranes has been obtained. The highest conductivity of $1.4 \times 10^{-4} \text{ S} \cdot \text{cm}^{-1}$ at 30°C for obtained polymers doped with 12.5 wt.-% lithium triflate, which corresponds well to the highest known conductivities for cross-linked polysiloxane-based salt-in-PEs.

PP 129. **ECOFIRENDLY SYNTHESIS OF DIINDOLYLMETHANE IN GREEN SOLVNET**

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Nowadays, reactions in unconventional media for sustainable organic synthesis, like aqueous media, supercritical media, fluorous biphasic catalysis, ionic liquids and biphasic combination, allow intensified separation technologies by selective recovery of the desired products, by-products, and the catalysts in different phases, thus avoiding tedious and costly procedures which involve high volumes of organic solvents. In this context, designing organic reactions in aqueous media is another attractive area in green chemistry. Water is the most abundant molecule on earth and the environmentally benign universal solvent, in which the chemistry of life processes mostly occur. As a reaction medium, it offers several benefits including control over exothermic reactions, salting in and salting out and variation of pH. Work up and purification can be carried out by simple phase separation techniques [1-2].

The indole nucleus is embedded the most ubiquitous heterocycle structure in many biological systems commonly found in nature as well as in many compounds that show pharmacological and biological activity. The bis(indolyl)alkane moiety is present in various natural products possessing important biological activity. Therefore, a number of synthetic methods for preparation of bis(indolyl)alkane derivatives have been reported in the literature by reaction of indole with various aldehydes and ketones in the presence of either a Lewis acid or a protic acid [3,4].

In this context, a green and environmentally benign protocol for novel squaric acid catalyst electrophilic substitution reactions of indole derivatives with various aldehydes in water and polyethyleneglycol in good to excellent yields is developed. The advantages of low sensitivity toward moisture and oxygen, high tolerance of different functional groups, green reaction media and efficient recyclability make this organocatalyst suitable for both laboratory and industrial scale synthesis of bis(indolyl)methanes under very mild conditions.

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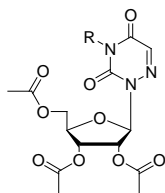
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PP 130. **N-3-ALKYLATED 2,3,5-TRI-O-ACYL- β -D-RIBOFURANOSYL- AND 2,3,4,6-TETRA-O-ACETYL- β -D-GLUCOPYRANOSYL-6-AZAUACILS**

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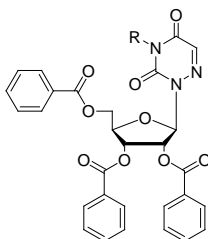
6-Azauracil, its β -D ribofuranoside and triacetyl derivatives are active anticancer drugs, which have also antileukemic, antiviral, immunosuppressive properties. They are capable to inhibit the biosynthesis of RNA and can modulate the action of known cancerolitics. Researches continues on the synthesis and study of new derivatives of 6-azauracil and its nucleosides in order to get more active cytotoxic and antiviral compounds. With aim to reduce the toxicity of 6-azauracil, the possible increase in the antitumor effect and the selectivity of action, we synthesized new N-3-alkylated 6-azauracil - β -D- ribofuranosides Ia-d, IIa,b and β -D glucopyranosides IIIa-d:



Ia-d

I: R=

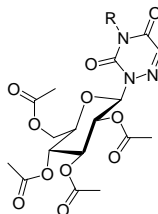
- a) n-Bu
- b) (4'-OMe-3'-NO₂-C₆H₃)-CH₂-
- c) (4'-OMe-3'-Br-C₆H₃)-CH₂-
- d) C₆H₅-CH₂-



IIa,b

II: R=

- a) (4'-OMe-3'-NO₂-C₆H₃)-CH₂-
- b) (4'-OH-3'-C(O)CH₃-C₆H₃)-CH₂-



IIIa-d

III: R=

- a) (4'-OMe-3'-NO₂-C₆H₃)-
- b) CH₂-
- c) (2'-Cl-C₆H₄)-CH₂-
- d) (2',4'-Me₂-C₆H₃)-CH₂-

Synthesis of the nucleosides I-III were accomplished by alkylation of peracylated 6-azauracil riboside and glucoside by butyl bromide and benzyl chlorides in potash/DMF medium.

The structure of the new nucleosides were established by TLC, elemental analysis and NMR (¹H and ¹³C) spectroscopy.

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**PP 131. PHOTOANISITROPIC PROPERTIES ENHANCEMENT VIA
INTRODUCING IONOGENIC FUNCTIONAL GROUPS INTO THE
MATERIAL AZODYE COMPONENT MOLECULES**

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For the purpose of achievement the polarization-sensitive materials' photoanisotropic properties enhancement we used ionogenic functional groups introduce into the azodye component molecules. There were carried out a development of both types of polarization-sensitive materials as well for stable and dynamic. Various polarization sensitive materials have been synthesized based on the polar water-soluble components. Substantial improvement photoanisotropic characteristics of these materials are revealed due to components molecules electrostatic polarity increasing, both for the polymer matrices from the one side and by modification the azodye molecule structure from the other [1].

It is shown that the number and especially the ionizing power imposed by the introduced functional groups determine the level of attainable photoanisotropy in materials which contain them. A capability of extremely high achievement photoanisotropic values in Mordant Pure Yellow tetrasodium salt (MPY-4Na) containing material is produced on the dye with expanded number of ionized substituent up to four units per molecule.

We have obtained a whole family of the various photoanisotropic material samples on the basis of polar water-soluble components having a close relationship among their chemical formulas. Each of them demonstrates substantially high level of attainable photoanisotropy than materials based on their non-ionized modifications.

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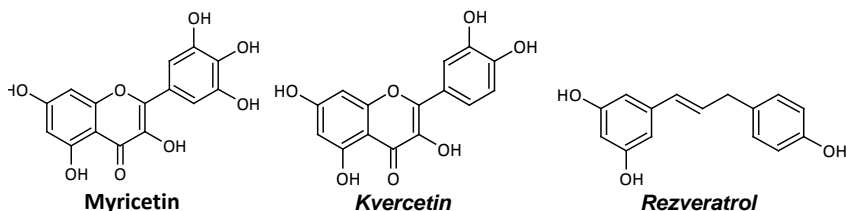
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PP 132. **DETERMINATION OF ANTIOXIDANT ACTIVITY OF WINES AND WINE'S MAJOR PHENOLIC COMPOUNDS BY ELECTRON SPIN RESONANS (ESR), USING SPIN-TRAPS METHOD**

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Determination of antioxidant activity of wines, including electron Spin Resonans method gives different results [1]. This may be due to the antioxidants' selectivity nature against different free radicals. Today Still lacks a unified approach for methods of measurement of antioxidant activity. Antioxidant potential of the wine must be measured against the free radicals which are produced naturally in living organisms during their metabolic processes. Such radicals are ROS free radicals: superoxide anion radicals, hidroperoxide radicals and especially the highly active hydroxide radicals. We developed spin-traps method using Electron Spin resonans (ESR) and measured the antioxidant activity of red and white Georgian and foreign country's wines and also their major penolic compounds: Trans- and Cis-Rezveratrol, Kvercetin, myricetin, Kaempferol, total phenols and total anthocyanins by spin-trap – DMPO - 5.5-dimetil-pirolin-N-oxide method. The formulas of some antioxidants are given below.



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PP 133. CITRUS EXTRACT - AN EFFECTIVE REMEDY FOR THE CORRECTION OF METABOLIC SYNDROME

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Metabolic syndrome is the combination of metabolic disorders such as carbohydrate metabolic disorder, arterial hypertension, obesity and dislipidemy. A currently favoured hypothesis is that oxidative stress is a complex pathogenic underlying mechanism of metabolic syndrome [1, 3] and hence it may be considered as a potentially useful target in therapies against the syndrome [2].

In the course of the project implementation we have produced the drink called “Elegance” designed for the correction of the components of metabolic syndrome – obesity, carbohydrate metabolic disorders, dislipidemy. The drink was produced out of local raw materials (citruses). Citrus extract for the production of the drink was obtained from tangerine debris (pulp and peel) in the industrial environment by the innovative technology elaborated by of the members of our scientific team. Citrus extracts from peeled fruits produced according to standard principle, as a rule, contain hesperidin and other hydrophilic compounds; apart from the latter the drink produced by our team is especially rich in lipophilic or otherwise fat soluble compounds, including polymethoxylated flavones [3], nobiletin, tangeritin that are characterized by a whole range of medicinal effects primarily due to their potent antioxidant properties.

The main goal of our study was clinical testing of the efficacy of the tangerine drink “Elegance” with potent antioxidant properties on the patients with metabolic syndrome without and with (carbohydrate metabolic disorders).

The treatment group of the patients were divided into two subgroups in accordance with GAE-classification (Georgian Association of Endocrinology) of metabolic syndrome: I group (20 patients with the average age of 44 ± 9.1) – metabolic syndrome without carbohydrate metabolic disorders (metabolic disorder being diagnosed based on the presence of the 3 following symptoms: obesity, arterial hypertension, dislipidemy); II group (20 patients with the average age of 50.1 ± 10.8) – metabolic syndrome with carbohydrate metabolic disorders (impaired glucose tolerance / Diabetes Mellitus type 2).

Conclusion:

1. Tangerine drink “Elegance”- pleasantly tasting drink; without any adverse side effects; it induces a decrease in appetite and food intake, it has diuretic effect and increases peristalsis of gastrointestinal tract.
2. “Elegance” exerts potent antioxidant effects as shown by the laboratory research data: it reduces oxidative stress which is a complex pathogenic underlying

mechanism of metabolic syndrome - “Elegance” normalizes activities of antioxidant enzymes and reduced bioavailability of nitric oxide as a primary pathogenic factor responsible for endothelial dysfunction, atherosclerosis and diabetic angiopathy.

3. A 4-month clinical trials have shown that “Elegance” is an effective remedy for the correction of components of metabolic syndrome:

- “Elegance” reduces abdominal obesity, which is one of the mediators of the development and progression of atherosclerosis and cardiovascular complications related to metabolic syndrome.
- “Elegance” corrects dislipidemy; it normalizes elevated levels of plasma Tg and reduced plasma levels of HDL – Chol which significantly determines the development and outcome of cardiovascular diseases during metabolic syndrome and diabetes mellitus type 2.
- “Elegance” effectively corrects carbohydrate metabolism disorders as indicated by significant reduction of glycated hemoglobin HBA1C in patients with impaired glucose tolerance/diabetes mellitus type 2.

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PP 134. **EFFECTS OF GEORGIAN MEAT CONDIMENTS**

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It has been suggested that the development of colorectal cancer correlates to diet-related factors (toxic products of animal fat cleavage). Our working hypothesis is that the antioxidant effects of traditional spices and condiments used during meat preparation and consumption may cause safety of meat courses.

We studied the effect of various Georgian meat spices and condiments on essential biological processes (energogenesis, apoptosis, free radical oxidation etc.) in *In vitro* model system of Jurkat cells.

In experiments on model system of Jurkat cells there was revealed that high cytoprotective activity provide water soluble extracts of *Mentha Pulegium*, *Satureja hortensis* L, *Tagetes patula* L, *Ocimum* and *Apium*. Among lypofilic compounds highest activity reviled in *Tagetes patula* L, and among etanol extracts - greek nut, *Satureja hortensis* L and rosmarin acid (from *Satureja hortensis* L).

The compounds derived from *Tagetes patula* L, carotinoid-luteine, quarcetagine and quarcetagin-7-glucoside, are characterised by sharply expressed stimulating activity on mitochondrial dehydrogenases. As a result these compounds contribute to intensification of mitochondria-induced oxidative stress that is detected by the decrease in the activity of antioxidant enzymes (glutathionereductase, and supetroxiddismutase). At the same time patuletine derived from *Tagetes patula* L is characterised by sharply expressed antioxidant activity. This feature is a basis of its antiapoptotic activity. Phenolpropanoids, derived from *Satureja hortensis* L and *Tagetes patula* L showed cytotoxic IL-2 stimulating activity, which is a basis of their antimicrobial property.

Revealed activity of the above mentioned species may ensure prevention of colorectal cancer.

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