
Publication of this issue is financially supported by:

Ministry of Education and Science of the Republic of Macedonia

Faculty of Technology and Metallurgy, SS Cyril and Methodius" University, Skopje

Institute of Chemistry, Faculty of Natural Sciences and Mathematics, SS Cyril and Methodius" University, Skopje

Oil Refinery OKTA, Skopje

Alkaloid, Skopje

TOCHEM DOOEL, Skopje

Објавувањето на овој број на списанието финансиски е поддржано од:

Министерство за образование и наука на Република Македонија

Технолошко-металуршки факултет, Универзитет „Св. Кирил и Методиј“, Скопје

Институт за хемија, Природно-математички факултет, Универзитет „Св. Кирил и Методиј“, Скопје

Рафинерија на нафта ОКТА, Скопје

Алкалоид а.д., Скопје

ТОХЕМ ДООЕЛ, Скопје

ВЕСТИ



**РЕПРОМАТЕРИЈАЛИ И ОПРЕМА
ЗА БЕЗАЛКОХОЛНИ И АЛКОХОЛНИ
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Технолошко-металуршки факултет



**Институт за хемија
Природно-математички факултет**

DOCTORAL THESIS

DEFENDED AT THE "SS. CYRIL AND METHODIUS" UNIVERSITY.
FACULTY OF TECHNOLOGY AND METALLURGY IN SKOPJE, 2009

Vineta Srebrenkoska

PRODUCTION AND CHARACTERIZATION
OF THE POLYMER ECO-COMPOSITES:
COMPARISON WITH THE CONVENTIONAL
AND POSSIBILITIES FOR THEIR REUSE

A b s t r a c t: In this dissertation, the compression and injection molding of polypropylene (PP) and poly(lactic acid) (PLA) based composites reinforced with rice hulls or kenaf fibers have been carried out. Maleic anhydride grafted PP (MAPP) and maleic anhydride grafted PLA (MAPLA) were used as coupling agents (CA) to improve the compatibility and adhesion between fibers and matrix. The composites were characterized by mechanical and thermal analysis, and it was found that the applied techniques for manufacturing of the eco-composites under certain processing conditions do not induce significant changes of the mechanical properties. The flexural strength of the compressed composite sample based on PP and kenaf is 51.3 MPa in comparison with 46.7 MPa for the one produced by injection molding technique.

Also, the composites based on phenolformaldehyde/polyvinylbutiral as a matrix and reinforced with different kinds of fabrics: glass, polyamide, aramide and high-performance (HPPE) fiber, have been produced, in order to determine the properties of eco-composites and to "evaluate" them within the family of "conventional" composites.

The investigations of the possibilities for reuse of the polymer eco-composites have been carried out. The eco-composites based on recycled matrices and recycled composites were produced and structure/properties relationships were investigated as a function of the number of reprocessing cycles. It was found that the recycling processes do not induce significant changes of flexural strength and thermal stability of the composites. In particular, PP-based composites reinforced with kenaf fibers are less sensitive to reprocessing cycles with respect to PLA-based composites reinforced with rice hulls. Also, the properties of the recycled matrices remain almost unchanged after recycling processes. In fact, the flexural strength and modulus of these materials are comparable to conventional phenolformaldehyde wood medium density fiberboards. For "conventional" composites, the preliminary investigation of the possibility for their reuse has been carried out by mechanical recycling

process which is more complicated and energy-consuming than recycling of the eco-composites.

As a result of comparison of the composites properties, the eco-composites based on PP and PLA are estimated in the category of materials which could be used as non load-bearing construction materials for different industries

Key words: eco-composites; polypropylene; rice hulls; kenaf fibers; compression molding; phenol-phormaldehyde; polyvinylbutiral; glass fibers; aramide fibers; HPPE fibers; polyamide fibers.
(2. VII 2009)

Ranko Adžiski

COMPOSITES WITH CONTROLLED POROUS
STRUCTURE OBTAINED FROM INDUSTRIAL
WASTE MATERIALS AND PRIMARY/SECONDARY
RAW MATERIALS

A b s t r a c t: This doctoral thesis is divided into two parts. The first part deals with fabrication of glass-ceramics with controlled porous structure by applying the multibarrier concept. Slags/quartz sand and waste glass were used as a raw materials. Three types of slag materials were used: slag from Feni, Republic of Macedonia, slag from Kakanj, Bosnia and Herzegovina, and slag from Zenica, Bosnia and Herzegovina. Waste glass from TV screens was used as a source for liquid phase during the liquid phase sintering. Best results showed the porous glass-ceramic composite consisted of slag Feni with addition of 20 wt% TV glass. Optimal slag granulation was $0.125 \div 0.063$ mm. The porous glass-ceramic composite possessed porosity of 43 %, and mechanical properties, such as E-modulus and bending strength of 10.19 GPa and 40.24 MPa, respectively, after sintering at 950 °C/2h. The permeability was 0.47 Da. This porous glass-ceramic composite was used for construction of diffuser for water aeration. Air bubbles with dimensions ranging from 0.1–0.5 mm were produced when air was passing through the porous glass-ceramic composite at a pressure of 10 kPa.

The second part deals with production of dense and porous mullite ceramics by activated reaction sintering a mixture consisting of SiO₂ and Al₂O₃ in stoichiometric composition for mullite synthesis. Rice husk and technical alumina were used

as precursors for SiO₂ and Al₂O₃, respectively. The conditions for production of pure SiO₂, white in colour and in amorphous state, from rice husk were defined in this doctoral thesis. Mechanical activation was performed on the mixtures for mullite synthesis, resulting in powders with particles size ranging from 20–50 nm. Consolidation of the powders was realized by cold isostatic pressing at 500 MPa, and sintering at 1200–1500 °C. The holding times on final temperatures ranged from 0.5–5 h. Pure-phase mullite was obtained at 1500 °C for 1h, but maximal mechanical properties were obtained after 2h sintering at same temperature. E-modulus and bending strength were 109 GPa and 154 MPa, respectively. The density was 93.5 % TD (theoretical density 3.20 g/cm³). The influence of MgO and B₂O₃ addition as catalysts on the pathway of mullite synthesis was investigated. They reduced the temperature of pure-phase mullite formation to 1400 °C, and increased significantly the mechanical properties. The activation energy for the reaction of mullite synthesis was reduced from 290.1 kJ/mol to 180.9 kJ/mol and 242.9 kJ/mol when MgO and B₂O₃ were added as catalysts, respectively. MgO addition induced anisotropic grain growth at 1500 °C. Contrary, B₂O₃ addition prompted the homogeneity of the microstructure, consisted of equiaxial mullite grains. An open cell mullite microstructure was fabricated after sintering at 1500 °C/3h by adding 40 wt.% active coal as a pore creator to the mixture for mullite synthesis with addition of MgO as a catalyst. The obtained porous mullite ceramic possessed porosity of 26 %, and E-modulus and bending strength of 63 GPa and 58 MPa, respectively. The permeability was 0.11 Da. This porous mullite ceramic was used for construction of diffuser for water aeration. Air bubbles with dimension of 0.05 mm were obtained when air was passing through the porous mullite structure in water medium at pressure of 30 kPa.

Key words: slag; rice husk; mullite; porous ceramics; air diffusers

(22. IX 2009)

Katarina Davalieva

CLONING AND EXPRESSION OF THERMOSTABLE DNA POLYMERASE GENES AND CONSTRUCTION OF ENZYMES WITH IMPROVED CHARACTERISTICS

A b s t r a c t: DNA polymerases are a family of enzymes which are essential for the replication and maintenance of all organisms. Their function in vivo is synthesis of a complementary copy of an existing DNA template. This property of DNA polymerases is used in molecular biology for a wide range of techniques. Since the discovery of Taq polymerase, numerous thermostable polymerases

from different thermopiles and with different enzymatic properties were discovered. Most of the native thermostable DNA polymerases have certain properties that restrain their use in PCR and sequencing. Therefore, research of thermostable polymerases is towards creation of genetically modified enzymes with improved characteristics.

The main goals of this research is cloning and expression of Taq, Tth and Tne DNA polymerase genes, creation of modified forms of Taq polymerase by deletion of 5'→3' exonuclease domain and insertion of point mutation and investigation of possibility of long-range amplification by using mixture of Taq or its modified forms and Tne polymerase.

Two expression vectors were used: pTTQ18 and pGEX-6P-1. DNA polymerase genes of Taq, Tth and Tne were cloned and expressed in pTTQ18 vector. In pGEX-6P-1 vector were cloned and expressed three 5'→3' exonuclease free variants of Taq polymerase: Klentaq 235, Klentaq 278 and Klentaq 289 and cold-sensitive mutant Klentaq278 (M707) in which cold-sensitive mutation Cd707ATT→CTT (Ile→Leu) was introduced by site-specific PCR mutagenesis. The yield of the recombinant enzymes obtained from pTTQ18 system was 25 to 60 U/ml medium (specific activity 2.500–6.000 U/mg) and this yield is 10 to 30 times higher than the yield of enzymes obtained from pGEX system (specific activity 17.000–22.500 U/mg).

The polymerase is characterized with highest thermostability, followed by Tth and Taq. Klentaq-235 Klentaq278 and Klentaq289 have 89%, 94% and 45%, respectively, from Taq thermostability. Klentaq278(M707) has approximately 88% of Klentaq278 thermostability. Tth polymerase is characterized with highest tolerance of Na, K, and Mg salts, followed by Taq and Tne. Klentaq278(M707) has two times less tolerance of K and Mg and no tolerance of Na. Tth polymerase has the greatest tolerance of blood and phenol as inhibitors of PCR (30% (v/v) of blood and up to 1% (v/v) of phenol), compared to other polymerases.

Native enzymes are more processive from Klentaq enzymes and can amplify longer DNA fragments, but successful amplification especially of longer fragments depends on "hot start". Klentaq278(M707) has 12 times less polymerase activity at room temperature and can be used in PCR without "hot start" but only for fragments up to 1 kb. Due to moderate proofreading activity of Tne polymerase, enzyme mixtures of Klentaq278 and Tne in the ratio of 10:1 can be used for amplification of DNA fragments for up to 8 kb.

Key words: Thermostable DNA polymerase; PCR; site-directed mutagenesis; hot start; cold sensitive DNA polymerase; long-range PCR.

(25. IX 2009)

МАГИСТЕРСКИ ТРУДОВИ

ОДБРАНЕТИ НА ТЕХНОЛОШКО-МЕТАЛУРШКИОТ ФАКУЛТЕТ ПРИ УНИВЕРЗИТЕТОТ „СВ. КИРИЛ И МЕТОДИЈ“ ВО СКОПЈЕ ВО 2009 ГОДИНА

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Александар Коста Ана стасовски, Развој на модел за оддржливо производство фабриката за квасец и алкохол со метод на процесна интеграција (Process integration for sustainable development of yeast and alcohol manufacture), 13. 05. 2009

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Снежана Дончо Стојанова, Примена на статистичка процесна контрола во производство на софтвер (Implementation of statistical process control in software production), 10.07.2009

Катерина Дончо Буревска, Агсорпциони карактеристики на дисперзни тврди системи (зеолити, активни јаглени и нано Al_2O_3) (Adsorption characteristics of disperse solids (zeolites, active carbons and nano- Al_2O_3), 26.08.2009

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СПЕЦИЈАЛИСТИЧКИ ТРУДОВИ

ОДБРАНЕТИ НА ТЕХНОЛОШКО МЕТАЛУРШКИОТ ФАКУЛТЕТ ПРИ УНИВЕРЗИТЕТОТ „СВ. КИРИЛ И МЕТОДИЈ“ ВО СКОПЈЕ ВО 2009 ГОДИНА

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**ДИПЛОМИРАНИ СТУДЕНТИ
НА ТЕХНОЛОШКО-МЕТАЛУРШКИОТ ФАКУЛТЕТ ПРИ УНИВЕРЗИТЕТОТ „СВ. КИРИЛ И МЕТОДИЈ“
ВО СКОПЈЕ, 2009 ГОДИНА**

Биотехнологија

5771	Јованова Мијалче Александра	13 февруари
5601	Спасов Костаке Љупчо	21 мај
5768	Анчева Славе Лина	3 јуни
5813	Пејчиновски Саво Мартин	3 јуни
5800	Павлова Благој Елвира	6 јуни
5455	Нововиќ Слободан Марко	25 јуни
4902	Тапанџиоски Младен Горан	2 јули
5804	Ромевска Величко Слободанка	2 јули
5194	Саров Васил Александар	27 август
5446	Стојковиќ Милан Елизабета	23 септември
5297	Сиљановски Иван Филип	9 октомври
4838	Пешева Добре Наташа	18 ноември
5894	Камчева Стефан Елена	6 ноември
5899	Јованов Славчо Александар	26 ноември

Прехранбено и биотехнолошко инженерство

4686	Ивановски Јосиф Момчило	6 февруари
4045	Лазарова Илчо Билјана	27 февруари
1315	Неделкоски Илија Зоран	30 април
3684	Апостолова Ванчо Виолета	7 мај
3694	Гацова Благој Благојка	28 мај
4160	Буреска Благоја Марија	3 јуни

Базно неорганско инженерство

4149	Моневска Љубе Даниела	26 јануари
4935	Узунова Васил Викторија	5 ноември

Конфекциско инженерство

5637	Георгиева Георги Емилија	26 јануари
4798	Атанасовски Боро Александар	5 февруари
5751	Стојанова Стојанче Тања	10 февруари
5789	Стојановска Блаже Елена	11 февруари
5761	Сарафимова Ангел Ирена	13 февруари
4852	Данева Коце Сунчица	13 март
4536	Петровска Томче Сања	28 мај
2816	Златковска Фиданчо Сузана	26 мај
5507	Иванова Генчо Николинка	18 мај
5210	Паскалиева Митко Сања	24 јуни
5686	Стојчевска Санде Ана	25 јуни
5915	Ристовска Драган Емилија	3 јули
5914	Николова Ванчо Јулијана	3 јули
5535	Бонева Томе Илинка	6 јули
5896	Мирчевска Влатко Далиборка	2 септември
5595	Саити Љуан Бесник	9 септември
5737	Мишова Слободанчо Билјана	14 септември
5753	Бежановска Радован Благоица	7 септември
5826	Трајчева Живко Јагода	18 септември
5774	Стамболиска Љупчо Фимка	18 септември
5520	Димитровска Васил Екатерина	5 октомври
5902	Симоновска Никола Марија	3 ноември
5076	Велкова Панче Катерина	11 ноември
4800	Арсов Глигор Здравко	24 ноември
5781	Симоновски Љупчо Гоце	26 ноември
5620	Шурбановска Мирко Бојана	7 декември
5634	Костов Косто Игор	15 декември
5415	Кимевска Никола Александра	22 декември

Дизајн и менаџмент во хемиската индустрија

5457	Ѓоргиевска Методије Билјана	27 април
4756	Тодоров Тодор Горан	29 јуни
4411	Шуманов Јованче Миле	15 септември
4337	Ѓошев Бојан Филип	8 октомври
4418	Тасевска Божин Татијана	6 ноември
4548	Трајковски Трајче Никола	18 ноември
5480	Георгиевска Јордан Наташа	17 декември
5385	Трајковски Трајче Мирослав	23 декември

Преработувачка металургија

5750	Конески Владо Зоран	25 март
1895	Лукарев Симеон Владимир	27 мај
5451	Ѓорѓевиќ Александар Мирослав	24 јуни
4051	Димоски Славе Драган	27 ноември

Екстрактивна металургија

5549	Кузманов Зоран Александар	17 март
5447	Тасев Петар Томе	17 март
4644	Тодоровска Љубе Ана	7 април
3617	Бурески Спасе Кире	8 април
4141	Маринкова Станко Виолета	14 мај

Базно органско и полимерно инженерство

5645	Ѓуроски Науме Илче	20 март
4543	Јаневска Аце Анче	13 февруари
2325	Наумоска Наум Виолета	21 мај
3425	Војнеска Војне Ленче	29 јуни
5613	Силјаноска Бранко Гордана	30 јуни
5960	Николоски Ратко Миланчо	19 ноември
4447	Алексов Владимир Љупчо	30 ноември
5680	Турунидов Евстратиос Јосиф	28 декември

Прехранбена технологија

4078	Давидовиќ Славко Ненад	09 февруари
5740	Здравковска Санде Оливера	13 февруари
5807	Илиева Тоде Веца	13 февруари
5808	Илиева Тоде Виолета	13 февруари
5748	Велковски Мирко Димитар	20 февруари
4793	Крајц Ѓоко Снежана	27 март
5599	Аљија Авдула Џељан	06 април
5114	Ристески Ратко Марјан	21 април
5622	Николов Благој Златко	29 мај
4455	Стефановска Живко Јелена	22 мај
5736	Темков Владимир Мишела	26 јуни
3940	Спасовска Слободан Јасмина	1 јули
5590	Игнева Спасе Цветанка	3 јули
5483	Атанасовски Самоил Иван	3 јули
5773	Стоилова Мито Софка	9 јули
5701	Георгиевска Љубомир Магдалена	27 август
5777	Дејаноски Бошко Дарко	14 септември
5749	Шилковски Пецо Алексеј	22 септември
5829	Митевска Мите Зорица	26 ноември
5938	Бојчевска Златан Бранкица	23 декември
5876	Ристов Лазо Ванче	24 декември
4362	Алулоски Митре Јордан	29 декември
5496	Петроска Велко Ана	29 декември

Петрохемиско инженерство

3288 Димитровска Перо Невена 21 мај
 4105 Гурчиновска Стојан Горјана 2 октомври

Инженерство за неметали

5602 Грозданова Томе Катерина 23 јуни

Керамичко инженерство

4111 Апостолоски Благоја Николче 7 мај
 4107 Јаневски Ордан Стојанче 23 септември
 1695 Чиплаковска Трајана Александра 30 септември

DOCTORAL THESIS

**DEFENDED AT THE "SS. CYRIL AND METHODIUS" UNIVERSITY,
 FACULTY OF NATURAL SCIENCES AND MATHEMATICS IN SKOPJE, 2008**

Violeta Ivanova

**DEVELOPMENT OF METHODS
 FOR IDENTIFICATION AND QUANTIFICATION
 OF PHENOLIC COMPOUNDS IN WINE
 AND GRAPE USING SPECTROPHOTOMETRY,
 LIQUID CHROMATOGRAPHY
 AND MASS SPECTROMETRY**

A b s t r a c t: Wines and grapes contain a large array of phenolic compounds belonging to flavonoids and non-flavonoids. This study evaluates the polyphenolic content of commercial wines and grapes, as well as red (Vranec and Merlo) and white (Smederevka and Chardonnay) wines prepared under different vinifications. Grapes from same varieties were analyzed at different ripening phases. Spectrophotometric methods were applied for determination of total phenolics, total flavonoids, total anthocyanins and total flavan-3-ols in wines and grape extracts. For polyphenolics extraction from grape pulp, seeds and skins, the efficiency of acetone/water (80/20) and methanol/water (80/20) solutions were compared observing better extraction efficiency using acetone/water. Red wines Vranec and Merlot, were produced using a series of fermentation conditions: same maceration times of 3, 6 and 10 days, two levels of sulphur dioxide (30 and 70 mg/l SO₂) and two yeasts for fermentation. The effects of the variety, maceration time, yeast and SO₂ on the content of phenolic acids, anthocyanins and flavan-3-ols were assayed by reversed-phase HPLC performed either directly or, for proanthocyanidins, after acid-catalysed cleavage in the presence of phloroglucinol. The influence of time of storage on phenolic compounds was checked by spectrophotometric methods. It was noticed that Vranec wines contained higher amounts of anthocyanins, hydroxycinnamic acids and tannins compared to Merlot wines made in the same way. The content of anthocyanins, phenolic acids and flavan-3-ols in the wines varied greatly with the winemaking conditions. Higher concentrations of anthocyanins and hydroxycinnamic esters were measured in wines made with 6 days of maceration, while tannin and

flavan-3-ol monomer concentrations were higher in the wines macerated for 10 days. Higher level of SO₂ resulted in increased extraction of all phenolic compounds especially after short maceration, suggesting that SO₂ increases the extraction rate. No significant difference in phenolic acid and anthocyanin contents was found in the wines fermented with different yeasts.

Different forms of anthocyanins exist at wine pH: the flavylium cations, the quinoidal anhydrobase, the carbinol pseudobase and the chalcone forms. The effect of pH of the sample and mobile phase on anthocyanin analysis was explored. High acidity of the mobile phase is needed for chromatographic analysis of anthocyanins to keep them in their flavylium red forms which, on the other hand, is incompatible with the response of phenolic acids in the electrospray source in negative mode and their MS detection. Maximum flavylium response was obtained in the samples acidified to pH 1.2 and elution using 1 % (V/V) formic acid in the HPLC mobile phase, which was found as a suitable compromise allowing proper separation and detection of anthocyanins and phenolic acids as well as lower current in the MS source. The optimized conditions were applied for MS identification of 69 compounds from different phenolic groups present in Vranec and Merlot wines.

Matrix-assisted laser desorption/ionization mass spectrometry, as a new valuable screening technique for identification of anthocyanins in wine and grape samples, was used in this study. Several MALDI matrices were tested: α -cyano-4-hydroxycinnamic acid (CHCA), sinapic acid (SA), 2,5-hydroxybenzoic acid (2,5-DHB) and C70 fullerene in order to check and compare their efficiency for anthocyanin identification. It was found that 2,5-DHB was superior with respect to all the matrices tested. For the first time, fullerene was introduced as a new possible matrix for MALDI-TOF-MS analysis of anthocyanins in wines and grapes.

Statistical treatment, including Principal Component Analyses, Cluster Analyses and Student-Newman-Keuls test were applied in order to ascertain grouping of the samples, as well as possible

significant differences between the studied wines, grape varieties and vinifications.

Key words: anthocyanins; phenolic acids; flavan-3-ols; flavonols; dihydroflavonols; phenolic alcohols; HPLC-DAD-MS; identification; vinifica-

tion; maceration time; yeast; SO₂ influence; colour intensity; hue; winemaking; spectrophotometry; Vranec; Merlot; Smederevka; Chardonnay. (15. 10. 2009))

МАГИСТЕРСКИ ТРУДОВИ

ОДБРАНЕТИ НА ИНСТИТУТОТ ЗА ХЕМИЈА НА ПРИРОДНО-МАТЕМАТИЧКИОТ ФАКУЛТЕТ ПРИ УНУВЕРЗИТЕТОТ „СВ. КИРИЛ И МЕТОДИЈ“ ВО СКОПЈЕ ВО 2009 ГОДИНА

Тасеска Величе Милена, Методи за определување на траги од елементи во минерали и соли на бакар, железо и манган со неутрална активациона анализа и атомска апсорпциона спектрометрија (**Taseska Veliče Milena**, Development of methods for determination of trace elements in minerals and salts of copper, iron and manganese using neutron activation analysis and atomic absorption spectrometry) (**30. 1. 2009**).

Тренчевска Стојан Олгица, Примена на микрочип електрофореза и масена спектрометрија за определување на протеини во серум и ликвор (**Trenčevska Stojan Olgica**, Application of microchip electrophoresis and mass spectrometry for determination of proteins in serum and liquor) (**10. 7. 2009**).

Најдоска Љубомир Менче, Анализа на етерично масло изолирано од сладок анасон со тенкослојна хроматографија и гасна хроматографија со масена спектрометрија (**Najdoska Ljubomir Menče**, Analysis of essential oil isolated from sweet fennel with thin layer chromatography and gas chromatography-mass spectrometry) (**29. 09. 2009**).

Петрушевски Гоце Ѓорѓи, Кристална структура, полиморфи и солвати кај фармацевтски активната супстанца натриум валпроат (**Petruševski Goce Gjorgji**, Crystal structure, polymorphs and solvates of the pharmaceutical ingredient sodium valproate) (**13. 11. 2009**).

ДИПЛОМИРАНИ СТУДЕНТИ ПО ХЕМИЈА НА ИНСТИТУТОТ ЗА ХЕМИЈА НА ПРИРОДНО-МАТЕМАТИЧКИОТ ФАКУЛТЕТ ВО СКОПЈЕ ВО 2009 ГОДИНА

Наставна насока

(дипломирани професори по хемија)

10057	Перкоска Киро Мирјана	11 февруари
6319	Петровска Драган Радица	10 март
7455	Колева Петре Марина	18 јуни
10332	Сидорова Никола Павлина	26 јуни
8644	Јовановска Љубе Марина	26 јуни
9285	Дамјаноски Зоран Гоце	8 јули
8068	Кировска Драгољуб Тања	13 јули
8326	Тасевска Стојан Лидија	31 август
8046	Јанковска Миле Биљана	17 септември
9504	Данилова Јордан Наталија	15 октомври
8643	Милошеска Лазар Ангелина	20 октомври
10542	Нусева Ристе Катерина	21 октомври
7454	Симоновиќ Борко Сузана	30 октомври
10737	Шаботиќ Џеко Анела	20 ноември
10736	Абазоски Канија Изеир	20 ноември
7876	Лавринска Бранислав Марија	11 декември
9281	Кулумовска Јован Анѓа	25 декември
8037	Кадрии Залфи Бесим	25 декември

Применета насока

(препаративна и аналитичко-структурна поднасока)
(дипломирани инженери по хемија)

6693	Михајлова Добре Весна	28 мај
10551	Тушевска Илија Весна	12 јуни
10549	Андреевска Љубе Валентина	16 јуни
11122	Антиќ Слаѓан Ивана	26 јуни
10741	Димовска Гоце Бојана	26 јуни
10745	Јовановски Драган Горан	26 јуни
10338	Исаки Џеват Ајљин	13 јули
6870	Селман Бејтула Ајџа	14 јули
10336	Петрушевиќ Аца Сања	26 август
7123	Филиповски Киро Томче	10 септември
1359	Станковска Миомир Сузана	22 септември
7475	Џочкова Иван Елена	24 септември
7125	Симоновска-Стојановски Коле Катерина	5 октомври
10543	Јосковски Благој Тихомир	6 октомври
8649	Николов Александар Владимир	26 октомври
10767	Цветковска Вељо Јасмина	30 октомври
10748	Стаматовска Мојсо Николина	30 октомври
9711	Јорданова Петар Сања	20 ноември

7694	Јаневска Славе Снежана	11 декември	10165	Митревска Славе Тина	8 јули
	Насока аналитичка биохемија (дипломирани инженери по хемија)		10357	Наумова Мијалче Галаба	10 јули
10364	Темелковска Љупчо Јасна	27 јануари	8989	Ѓуровска Никола Ана	10 септември
10366	Чакмаков Гоне Кирил	3 февруари	8674	Милановска Зоран Андријана	16 септември
9738	Салтировски Душко Стефан	2 март	9516	Милкоска Владимир Жаклина	30 септември
10360	Тутаркова Зоран Даниела	10 март	11011	Лазарова Фило Даниела	2 октомври
9722	Спасовска Ацо Весна	16 март	9736	Станојловиќ Радиша Рената	7 октомври
10351	Јанчовска Ѓорѓи Маја	16 март	11165	Методијев Ставри Јелена	8 октомври
10356	Николовска Здравко Јасминка	20 март	10759	Јосифовска Владо Наташа	26 октомври
9294	Никова Ничо Марија	26 март	10756	Дамјанова Ѓорѓе Магдалена	28 октомври
10343	Атанаскова Матоди Тања	2 април	10755	Вељановска Ванчо Маја	28 октомври
9740	Алулоска Трајче Верче	30 април	10762	Пупиноска Морко Александра	29 октомври
10344	Арсовска Ласте Елена	11 мај	11009	Миленковска Данчо Бојана	29 октомври
5324	Георгиевски Љубен Бобан	22 мај	10763	Поповска Владе Олга	30 октомври
9515	Поповска Јордан Лилјана	22 мај	10753	Велкова Оливер Кристина	30 октомври
8666	Тодорова Заран Славица	29 мај	8671	Андоноvsка Томислав Кристина	30 октомври
10345	Божиновска Ѓокица Ивана	19 јуни	10758	Ѓоргиевска Драги Јасмина	16 ноември
9517	Ружојчиќ Милован Јелена	3 јули	10764	Стоименовска Драган Александра	16 ноември

**ДИПЛОМИРАНИ СТУДЕНТИ
ПО БИОЛОГИЈА-ХЕМИЈА НА ПРИРОДНО-МАТЕМАТИЧКИОТ ФАКУЛТЕТ
ВО СКОПЈЕ ВО 2009 ГОДИНА**

12561	Ѓурова Тоде Цвета	21 јануари	10666	Стојановиќ Драги Елена	10 јуни
10667	Најдеска Трајан Елена	17 февруари	10149	Саловска Ибруш Јасмина	21 јули
10668	Ристова Кирил Тања	6 март	12560	Симоновска Раде Шекерина	16 септември
10003	Динова Атанас Емилија	11 март	8340	Николова Ангел Габриела	23 септември
7617	Шапрданов Боге Ѓорѓи	13 март	10635	Китановска Дрган Габриела	29 октомври
10153	Кочовска Драган Кристина	13 април	10150	Стојменова Тодор Софија	30 октомври
10509	Јанковска Грозде Даниела	6 мај	10151	Трајкова Бранислав Даниела	30 октомври
12184	Неделковска Сојадин Вероника	18 мај	5037	Цекова Киро Маја	2 декември
12579	Тасеска Јован Славица	1 јуни			

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The data for new compounds should be quoted as follows: yield, melting (boiling) point, UV absorption, NMR spectra, mass spectrum and elemental analysis, e.g. 7 g (65 %); m.p 77–78 °C; UV(EtOH) $\lambda_{\text{max}}/\text{nm}$: 228 and 262 ($\log \epsilon/\text{dm}^3 \text{mol}^{-1} \text{cm}^{-1}$: 4.23 and 3.92; ^1H NMR (CdCl_2) δ/ppm : 2.30 (s, 3H, Me), 4.51 (d, 1H, 1,2 $J_{1,2} = 3.2$ Hz, H-3); ^{13}C NMR (CdCl_2) δ/ppm : 160 (C-5), 120 (C-2); MS m/z : 264 (M^+ , 100 %) and 246 ($\text{M}^+ - 18$).

Analysis. Calcd. mass fractions of elements, $w/\%$, for $\text{C}_{18}\text{H}_{13}\text{N}_3\text{O}_5\text{S}$ ($M_r = 383.38$) are: C 56.39, H 3.42, N 10.96, O 20.87, S 8.36; found: C 56.31, H 3.62, N 10.76, O 20.60, S 8.19. When describing more than 4 or 5 compounds, the data are best presented as a table.

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Journals:

- [1] P. Hobza, Z. Havlas, The fluoroform-ethyleneoxide dimer exhibits an antihydrogen bond, *Chem. Phys. Lett.* **303**, 447–452 (1999).

Books:

- [1] J.A. Roels, *Energetics and Kinetics in Biotechnology*, Elsevier Biomedical Press, Amsterdam, New York, Oxford, 1983.
- [2] H. Chum, M. Baizer, *The Electrochemistry of Biomass and Derived Materials*, ACS Monograph 183, American Chemical Society, Washington, DC, 1985, pp. 134–157.
- [3] J.W. Finley, G.A. Leveille, Macronutrient substitutes, in: *Present Knowledge in Nutrition*, E.K. Ziegler, L.J. Filer Jr. (Eds), ILSI Press, Washington DC, 1996, pp. 581–595.
- [4] С. Хаџи Јорданов, *Корозија и заштита на металите*, Нова Македонија, Скопје, 1993.

Scientific meetings:

- [1] M. Geraldес, L. Hes, M. Araujo, A. Marcincin, The Application of new performance PP fibers in functional knit structure, *Proceedings of International Textile Clothing and Design Conference*, Dubrovnik, Croatia, 2002, pp. 59–64.

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