

BOOK of ABSTRACTS

26th Congress of Chemists and Technologists of Macedonia

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на Хемичари
и Технологи
на Македонија

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Сојуз на хемичарите и технолозите на Македонија
Society of Chemists and Technologists of Macedonia

**26th Congress of
SCTM
with International Participation**

BOOK of ABSTRACTS

**20–23 September 2023
Metropol Lake Resort
Ohrid, N. Macedonia**



Сојуз на хемичарите и технолозите на Македонија

Society of Chemists and Technologists of Macedonia

20–23 September 2023, Metropol Lake Resort, Ohrid

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**РЕПУБЛИКА СЕВЕРНА МАКЕДОНИЈА
МИНИСТЕРСТВО ЗА ОБРАЗОВАНИЕ И НАУКА**

Ss. Cyril and Methodius University in Skopje



The 26th Congress of SCTM is a

 **EuChemS**
European Chemical Society

recognized event.

Dear Esteemed Colleagues and Participants,

It is with great pleasure that we present the Book of Abstracts for the 26th Congress of the Society Chemists and Technologists of Macedonia, which was originally scheduled for 2020 but, due to the global pandemic caused by Covid-19, has been rescheduled to this momentous occasion. As we gather here in the breathtaking backdrop of the historic city of Ohrid, Macedonia, we reflect not only on the innovative strides made in the field of chemistry and chemical engineering, but also on the unwavering spirit of resilience that has brought us together despite the challenges that have beset us. The world has experienced an unprecedented disruption, testing the limits of our adaptability and resolve. Yet, as chemists and chemical engineers, we have shown that the pursuit of knowledge and advancement knows no bounds. Our ability to transcend obstacles, adapt methodologies, and harness innovation in the face of adversity is a testament to the invincible human spirit.

Within the pages of this Book of Abstracts with 15 invited lecturers and almost 200 presentations from 174 authors and 570 coauthors from the region and much wider making it a really international meeting, you will find a diverse array of topics that reflect the vigor and dedication of the scientific community. From breakthroughs in green chemistry to pioneering developments in materials science, from the forefront of pharmaceutical research to cutting-edge advancements in nanotechnology, each abstract showcases the remarkable flexibility and ingenuity of our colleagues.

We extend our deepest gratitude to Prof. Jadranka Blaževska Gilev and Prof. Biljana Angjuševa, the organizers of this meeting who have dedicated all their efforts and time to make this meeting possible. Our gratitude goes to all members of the scientific and organizational committees who have been in the background making sure things flow seamlessly, especially to Assoc. Prof. Vojo Jovanov, Iva Dimitrievska and Marija Prosheva for managing the web page, Book of Abstracts etc. Also, our appreciation goes to the reviewers and all participants who have come together to give the substance to this Congress. Your commitment to the scientific endeavor underscores the importance of collaborative efforts in times of uncertainty. It is through the exchange of ideas, the sharing of knowledge, and the fostering of connections that we fortify ourselves and drive the progress of our disciplines. Furthermore, our deepest gratitude goes to the sponsors given at the end of the book and most of all to the Organization for the

Prohibition of Chemical Weapons who have always given their support to our meetings.

As we come together in Ohrid, we do so with renewed appreciation for the importance of shared experiences and face-to-face interactions. We eagerly anticipate the discussions, debates, and collaborations that will shape the future of our disciplines. Let us seize this opportunity to learn, inspire, and foster connections that will resonate long after the congress concludes.

We hope that this Book of Abstracts serves as a source of inspiration and a record of the remarkable work presented at the 26th Congress of SCTM. Let us seize this opportunity to celebrate not only our achievements, but also our resilience, determination, and enduring commitment to the pursuit of knowledge. Let us navigate the challenges together, and through our collective efforts, continue to inspire innovation that transforms the world in a positive way.

With warm regards,

Prof. Zoran Zdravkovski, president

Society of Chemists and Technologists of Macedonia



CONTENTS

PLENARY LECTURES

- PL 1** **L. Avérous** **1**
BioTeam/ICPEES-ECPM, UMR CNRS 7515, Université de Strasbourg, 25 rue
Bequerel, 67087 Strasbourg Cedex 2, France
Innovative Biobased Polyurethanes from Cradle to Cradle
- PL 2** **N. Sojic** **2**
University of Bordeaux, Bordeaux INP, ISM, UMR CNRS 5255, 33607
Pessac, France
**Ultrasensitive Electrochemiluminescence Imaging of Single
Entities: From Cells to Biomolecules**

INVITED LECTURES

- IL 1** **V. Mišković-Stanković** **3**
Faculty of Ecology and Environmental Protection, University “Union - Nikola
Tesla”, Cara Dušana 62-64, 11000 Belgrade, Serbia.
Biocompatible Poly(Vinyl Alcohol)-Based Hydrogels for Medical Applications
- IL 2** **L. Hes** **4**
Faculty of Textile Technology, Technical University of Liberec,
Liberec, Czech Republic
**The Effect of Garment Interlayers on Evaporation Resistance of
Textile Laminates with Hydrophilic Membranes**
- IL 3** **Mihaela Girtan** **5**
Photonics Laboratory, (LPhiA) E.A. 4464, SFR Matrix, Université d’Angers,
Faculté des Sciences, 2 Bd Lavoisier, 49000 Angers, France
On the Properties of Perovskites Thin Films for Solar Cells
- IL 4** **E. Bartkiene** **6**
Department of Food Safety and Quality, Faculty of Veterinary,
Lithuanian University of Health Sciences, Mickeviciaus str. 9, LT-
44307 Kaunas, Lithuania
Institute of Animal Rearing Technologies, Faculty of Animal Sciences,
Lithuanian University of Health Sciences, Mickeviciaus str. 9, LT-
44307 Kaunas, Lithuania
**Fermentation – From Food Industry By-Products Valorization to
Neurotransmitters Production**
- IL 5** **I. Ristić** **7**
University of Novi Sad, Faculty of Technology, Bul. Cara Lazara 1, Novi Sad, Serbia
Development of Novel Bio-Based Materials with Advanced Properties
- IL 6** **I. Martin-Fabiani** **8**
Department of Materials, Loughborough University, Leicestershire
LE11 3TU, UK
Harnessing Size Segregation Effects in Film-Forming Formulations

IL 7	I. Merta Institute of Material Technology, Building Physics, and Building Ecology, Faculty of Civil Engineering, TU Wien, 1040 Vienna, Austria Recycled Aggregate Concrete - Current Challenges	9
IL 8	N. Đurišić-Mladenović University of Novi Sad, Faculty of Technology Novi Sad, Novi Sad, Serbia Occurrence of Contaminants of Emerging Concern in Water Resources and the Related Analytical Challenges	10
IL 9	E. Fidanchevski Ss. Cyril and Methodius University in Skopje, Faculty of Technology and Metallurgy, Ruger Boshkovich 16, 1000, Skopje, N. Macedonia Secondary Raw Materials in Line to The Circular Economy Concept for Supporting Smart Specialization Strategy	11
IL 10	E. Velickova Department of Food Technology and Biotechnology, Faculty of Technology and Metallurgy, Ss. Cyril and Methodius University in Skopje, N. Macedonia Impact of Food Texture on Food Oral Processing and Sensory Analysis	12
IL 11	B. Pejova Institute of Chemistry, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University in Skopje, N. Macedonia Quantum Dot Solids with Tunable Optical Properties on Glass Substrates	13
IL 12	J. Petreska Stanoeva Institute of chemistry, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University in Skopje, N. Macedonia Phytochemical Analysis: Extraction, Characterization and Diversity of Bioactive Secondary Plant Metabolites	14
IL 13	Y. Joseph TU Bergakademie Freiberg Institut für Elektronik- und Sensormaterialien, Freiberg, Germany Nanomaterial-Based Chemical Sensors	15

ORAL AND POSTER PRESENTATIONS

INORGANIC CHEMISTRY AND TECHNOLOGY, INORGANIC MATERIALS AND METALLURGY

ORAL PRESENTATIONS

- ICTM O-1** M. Fabián, B. I. Arias-Serrano, H. Kolev, J. Briančin, A. Yaremchenko, **16**
Calcium Containing ReAlO₃ (Re = La, Gd) Perovskites. Mechynosynthesis, Morphology and Electrochemical properties
- ICTM O-2** O. Risteski, H. Gjorgjievska T. Shishkova, A. Chankulovska Tenovska B. **17**
Boshkovski and S. Bogoevski
Modification of Mechanical and Thermal properties of Epoxy-Inorganic Composites
- ICTM O-3** Vojo Jovanov, Snezana Petrovic, Sinisa Markov, Biljana Angjusheva, Emilija **18**
Fidancevski, Jonjaua Ranogajec
Frost Resistance and Biocorrosion of Ceramic Composites
- ICTM O-4** R. Mravljak, A. Podgornik **19**
Silver Nanoplates: Morphology Exhibiting Strong Plasmonic and Catalytic Properties

POSTER PRESENTATIONS

- ICTM P-1** S. Knežević, M. Ivanović, D. Kisić, S. Nenadović, J. Potočnik and M. Nenadović **20**
Microstructural Analysis of Thermally Treated Geopolymer Incorporated with Neodymium
- ICTM P-2** M. Nenadović, D. Kisić, M. Ivanović, S. Knežević, S. Nenadović and L. Kljajević **21**
Physicochemical, Radiological and Structural Properties of Alkali Activated Materials – Future Trends and Applications
- ICTM P-3** M. Rosić, M. Milošević, M. Čebela, V. Dodevski, V. Lojpur, R. Ljupković **22**
and A. Zarubica
Investigation of Co_{0.9}Ho_{0.1}Mo₄ Nanopowders Obtained by Glycine Nitrate Procedure
- ICTM P-4** S. Nenadović, L. Kljajević, M. Nenadović, M. Ivanović, S. Knežević, N. **23**
Mladenović Nikolić and I. Vukanac
Green Alkali Activated Materials Based on The Different Precursors
- ICTM P-5** J. Gulicovski, M. Nenadović, M. Mirković, Lj. Kljajević, I. Bošković, M. **24**
Vukčević and S. Nenadović
Preparation and Performance of Low Content Carbon Geopolymer
- ICTM P-6** D.Kočović S. Shova, Z. D. Tomić and Ž. Jaćimović **25**
Molecular and Crystal Structure of the Bis(Acetato)-Bis(4-Methyl-1h-Pyrazole)-Zinc(Ii)
- ICTM P-7** M. Šuljagić, L. Andjelković, and D. Jeremić **26**
Semiconducting Co₃O₄ Nanocatalyst Prepared by Eco-Friendly Thermal Decomposition
- ICTM P-8** V.Mangovski K.Anastasova, F.Godjo and A.M.Cvetanovska **27**
Production of Silver Salts in Alkaloid AD Skopje

ICTM P-9	<u>G. Radića</u> and V. Jevtićb Synthesis and Characterization Of New Copper(II) and Palladium(II) Complexes with S,O-Tetradentate Ligand as Derivative of Thiosalicylic and Thiopropionic Acids	28
ICTM P-10	<u>N. N. Mladenović Nikolić</u> , S. Knežević, M. Ivanović, M. M. Mirković, M. Maletić, L. M. Kljajević and K. V. Trivunac Structural Characteristics and Adsorption Properties of Alkali Activated Blends Ashes/Metakaolin	29
ICTM P-11	<u>T. Skalar</u> , J. Rozman, A. Pondelak Improving the Surface Consolidation of Historical Material Using Calcium-Based Consolidants	30
ICTM P-12	<u>M. Shopska</u> , K. Tenchev, G. Kadinov Heterogeneity of Adsorption and Reaction Sites on Silica Supported (10%Co+0.5%Pd) Catalyst Surfaces During CO Hydrogenation	31
ICTM P-13	<u>M. Ivanović</u> , S. Knežević, M. Mirković, Lj. Kljajević, M. Nenadović, N. Mladenović Nikolića and S. Nenadović Physico-Chemical Properties of Geopolymers Based on Metakaolin with The Addition of Organic Phase PVA	32
ICTM P-14	<u>O. Porodko</u> , M. Fabián, H. Kolev, M. Lischnichuk, M. Zukalová, V. Girman Development of High Entropy Spinel Oxides Prepared via Ball Milling	33
ICTM P-15	<u>G. A. Mousdis</u> , T. Giannakis, S-K Zervou, A. Hiskia, T. Triantis, C. Christophoridis, D. Iossifidis, and M. Kandyla Photocatalytic Activity of Sol-Gel Prepared TiO2 Thin Films Doped with Degussa Nanoparticles	34
ICTM P-16	<u>B. Cekova</u> , M. Marina – Puncheva, and F. Jovanovski Application of Zeolite in Agriculture	35
ICTM P-17	B. Jankulovska, <u>B. Peeva</u> , L. Robeva Čukovska, E. Fidanchevski Characterization of Pottery Vessels Excavated at The Archaeological Site Stobi in Republic of North Macedonia	36
ICTM P-18	<u>E. Stojchevska</u> and A. Bužarovska Electrospun BaTiO3 Nanofibers	37
ICTM P-19	<u>B. Cheliku Ramadani</u> , S. Popovska, M. Bukleski, A. Reka, S. Dimitrovska-Lazovab and S. Aleksovska Synthesis and Investigation of Complex Perovskites with Manganese	38
ICTM P-20	<u>C. Trajkovska</u> , S. Popovska, M. Bukleski, S. Dimitrovska-Lazova and S. Aleksovska Synthesis and Investigation of Ln_{1-x}Er_xFe_{0.5}Mn_{0.5}O₃ (Ln = La, Sm; x = 0.2 and 0.4)	39
ICTM P-21	<u>M. Trajkova</u> , D. Stojcheva, M. Bukleskia, S. Dimitrovska-Lazova, S. Aleksovska Synthesis and Characterization of Hybrid Organic-Inorganic Perovskites with Morpholinium as an Organic Cation	40
ICTM P-22	R. Ilieva, <u>D. Rabadjieva</u> , O. Petrov Calcium Phosphate Ceramic Tablets for Studying De- and Remineralization Processes	41

ICTM P-23	<u>K. Sezanova</u> , R. Gergulova and D. Rabadjieva Polycarboxy/Sulfo Betaine Functionalized Calcium Phosphates Obtained by Adsorption Process	42
ICTM P-24	<u>Y. Tuparova</u> , D. Rabadjieva, P. Markov Morphological and Thermal Characteristics of the Mechanochemically Activated Calcium Phosphates	43
ICTM P-25	<u>B. Angiusheva</u> , V. Jovanov, E. Fidanchevski Comparative Crystallization Behaviour of Glass-Ceramics Derived from Raw and Modified Coal Fly Ash	44
ICTM P-26	<u>B. Angiusheva</u> , I. Merta, E. Fidanchevski Alkali Activation of Coal Fly Ash and Construction and Demolition Waste: A Sustainable Path to Innovative Materials	45

ORGANIC CHEMISTRY, BIOCHEMISTRY AND PHARMACEUTICAL CHEMISTRY

ORAL PRESENTATIONS

OBPC O-1	<u>I. Erdil</u> , J. Bogdanov, Dz. Kungulovski and N. Atanasova-Pancevska Effect of Pure Anethole and Synergistic Interaction of Anethole with Different Essential Oils- Potential Alternative Biocontrol Products Against Plant Pathogens	46
OBPC O-2	<u>I. Erdil</u> , J. Bogdanov, Dz. Kungulovski, and N. Atanasova-Pancevska Phenol Biodegradation Using Native and Granulated Microorganisms Adapted from Petroleum Wastewater	47
OBPC O-3	<u>J. Ajduković</u> , Đ. Janković, S. Bekić, A. Čelić and E. Petri New 17α-picolyl Androstane Derivatives: Synthesis, <i>In Vitro</i> Biological Activity and <i>In Silico</i> ADME/T Properties	48
OBPC O-4	<u>M. Chochevska</u> , K. Kolevska, M. Atanasova Lazareva, M. Velichkovska, F. Jolevski, E. Janevik Ivanovska, A. Ugrinska and B. Angelovska The Role of Chemistry in the Development of the Radiosynthesis Methods for Fluorine-18 Radiopharmaceuticals	49
OBPC O-5	<u>J. Kaneti</u> and S. M. Bakalova Model of G-quadruplex Interactions with Heterocyclic Ligands	50
OBPC O-6	M. Khalife, D. Stankovic, V. Stankovic, J. Danicka, F. Rizzotto, V. Costache, A. Slama-Schwok, P. Gaudua and <u>J. Vidic</u> Electrochemical Biosensor Based on NAD(P)H-dependent Quinone Reductase for Rapid and Efficient Detection of Vitamin K₃	51
OBPC O-7	<u>M. Stefanovska</u> * and A. Kjulumoska-Gjorgjievska Method for Analysis of Terpenes in <i>C. Sativa</i> Using Headspace GC-FID and GC-QQQ	52
OBPC O-8	<u>M. P. Savić</u> ^a , T. Lj. Šestić, D. Dj. Škorić, L. Rárová New Thiazole Androstane Derivatives: Synthesis and Cytotoxic Activity	53

POSTER PRESENTATIONS

OBPC P-1	M. Sazdovska, B. Trifunovski, <u>D. Bachvarovski</u> , B. Janeska Trajkovska, H. Tomovska, M. Ivanoska Zdravkovska, C. Janakieva and Gj. Petrushevski Method Validation for <i>in Situ</i> Identification of Diazepam with Raman Spectroscopy in Pharmaceutical Industry	54
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OBPC P-2	<u>M. Dimitrijević</u> , M. Nešić, M. Mladenović and N. Radulović New Esters from the Essential Oil of <i>Doronicum Columnae</i> Ten	55
OBPC P-3	<u>M. M. Zarić</u> , I. R. Radović and M. Lj. Kijevčanin Molecular Dynamic Simulations in Binary Liquid Mixtures	56
OBPC P-4	<u>I. Kuzminac</u> , S. Bekić, A. Ćelić, D. Jakimov, M. Sakač Synthesis, <i>In silico</i>, and <i>In vitro</i> Biological Testing of Novel 19-halogenated D-homo Lactone Steroids as Potential Antitumor Compounds	57
OBPC P-5	<u>V. Jakimovska Pokupec</u> , M. Stefova, and Gj. Petrushevski A Systematic Study of Esterification of Ibuprofen with Common Alcoholic Excipients using LC-MS/MS	58
OBPC P-6	<u>B. Bogatinovski</u> , M. Stojanovikj, D. Tomovski and F. Godjo Estimation of Measurement Uncertainty for Total Chlorides Content Determination in Concentrated Solutions for Hemodialysis	59
OBPC P-7	<u>E. Cvetkovska Bogatinovska</u> , V. Stefov, N. Geshkovski and Gj. Petrushevski Multivariate Analysis Approach in API-Excipient Compatibility Testing in the Development of Pharmaceutical Dosage Forms	60
OBPC P-8	<u>I. Todorovska</u> , K. Dragarska, N. Hadzi-Petrushev, M. Mladenov and J. Bogdanov Investigating the Structural Features of Some Monocarbonyl Curcuminoids: Insights Into Their Pharmacological Profile	61
OBPC P-9	<u>K. Dragarska</u> , I. Todorovska, R. Stojchevski, N. Hadzi-Petrushev, M. Mladenov, D. Avtanski, and J. Bogdanov Design and <i>in Vitro</i> Evaluation of Monocarbonyl Curcumin Analogs Eliciting Breast Cancer Cytotoxicity	62
OBPC P-10	<u>Z. D. Petrović</u> J. Branković, V. P. Petrović, M. Vukić, D. Simijonović, and V. Milovanović Inclusion Complexes of β-Cyclodextrin and Selected Phenolic Acid Derivatives	63
OBPC P-11	<u>M. Mladenović</u> , J. Liu, E.C. Muller, C. Lima, F. Boylan, and N. Radulović The Essential Oil of <i>Acmella Oleracea</i> (L.) R.K. Jansen: Structural Elucidation and Acute Toxicity of New Esters	64
OBPC P-12	<u>M. Mladenović</u> , B. Ilić, L. Vasić, J. Milovanović, M. Šević, S. Makarov, and N. Radulović Chemical Composition of the Defensive Secretion from <i>Pachyiulus Varius</i> (Fabricius, 1781) (Diplopoda, Julida)	65
OBPC P-13	<u>D. Stojanov</u> , M. Stojanovska Pecova, E. Stefova, B. Angelevska, M. Chachorovska, D. Kuneski and V. Stefov Metal salts of Ascorbic Acid and Their Stability at Stress Conditions	66
OBPC P-14	<u>B. Trifunski</u> , D. Bacvarovski, H. Tomovska, C. Janakieva, M. Ivanoska Zdravkovski and Gj. Petrushevski Method Optimization and Validation for Particle Size Distribution for Cefixime Trihydrate Using Malvern Mastersizer 3000	67
OBPC P-15	<u>L. Pavun</u> , A. Janošević-Ležaić and S. Uskoković-Marković Zinc Complex of 3-Hydroxyflavone: Spectrophotometric Determination and their Antioxidative Profiles	68
OBPC P-16	<u>V. P. Petrović</u> , J. Branković and Z. D. Petrović Selected Phenolic Hydrazones as Potential M^{PrO} Inhibitors	69

OBPC P-17	<u>J. Branković</u> , Z. D. Petrović, and V. P. Petrović Synthesis, Characterization, and Antioxidant Activity of the Selected Phenolic Hydrazone Derivatives	70
OBPC P-18	<u>B. Cekova</u> , F. Jovanovski The Role of Proteins in Cosmetic Preparations	71
OBPC P-19	K. Krstevska, M. Sencheva Petrevska, I. Jordanov and <u>V. Dimova</u> A Boiled-Egg to Predict Gastrointestinal Absorption and Brain Penetration of Sulfonylurea Herbicides	72
OBPC P-20	V. Dimova, <u>M. S. Jankulovska</u> and M. Sencheva Petrevska Analysis of QSAR Models Quality	73
OBPC P-21	K. Krstevska, M. Sencheva Petrevska, D. Dimitrovski and <u>V. Dimova</u> QSAR Modeling of Sulfonylurea Herbicides	74
OBPC P-22	<u>I. Davkova</u> , Z. Zhivikj, N. Draskovik, K. Shutevska, T. Kadifkova Panovska, A. Trajkovska, S. Kulevanova, I. Cvetkovikj Karanfilova, M. Karapandzova Volatile Compounds and Cytotoxic Effects of <i>Lavandulae Aetheroleum</i>	75
OBPC P-23	<u>Zuljeta Fetaovska</u> , Nora Dochi- Shakiri, Jasmina Petreska Stanoeva and Jane Bogdanov Analysis of Organic Compounds in Single-Use Gloves and Surgical Masks Using Spectroscopic and Gas Chromatographic Methods	76
OBPC P-24	<u>Nora Dochi- Shakiri</u> , <u>Zuljeta Fetaovska</u> and Jane Bogdanov GC-MS Analysis of Volatile Organic Compounds in Aerosol and Integral Parts Of IQOS® E-Cigarettes	77
OBPC P-25	<u>E. Stefova</u> , M. Stojanovska Pecova, D. Stojanov and M. Chachorovska Investigating the Interactions Between Active Pharmaceutical Ingredients and Lubricants Using FTIR Spectroscopy and DSC Analysis	78
OBPC P-26	<u>D. Trajkovikj</u> , M. Trajcev, B. Janeska Trajkovska and Gj. Petrusovski Determination of Trace Metals in Salbutamole Sulfate with ICP-OES	79
OBPC P-27	<u>M. Đorđević Zlatković</u> , D. Zlatković and N. Radulović Resolving a Long-Standing Discrepancy: Investigating the Configuration and Occurrence of 2,6-cyclocuparan-3-ols	80
OBPC P-28	<u>M. Đorđević Zlatković</u> , D. Zlatković and N. Radulović Chemical Analysis of the Diethyl-Ether Extract of <i>Microbiota Decussata</i>	81
OBPC P-29	<u>D. Zlatković</u> , M. Đorđević Zlatković, N. Radulović Comparative Analysis of Marjoram Essential Oils from Serbia and Egypt	82

ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

ORAL PRESENTATIONS

AEC O-1	<u>N. Đurišić-Mladenović</u> , J. Živančev, I. Antić Z. Šereš, B. Pajin, N. Maravić, V. Vasić, D. Lukić, M. Šćiban, S. Panić, M. Petronijević, J. Crespo, and M. Farre Innovative Approaches in Monitoring and Removal of Contaminants of Emerging Concern from Water	83
AEC O-2	<u>V. Mula</u> , J. Bogdanov, J. Petreska Stanoeva, Z. Zdravkovski Detection of Organic Compounds in Outdoor Urban Air in Kosova and Macedonia Using a Passive Sampling Technique and Gas Chromatography Coupled with Mass Spectrometry	84

AEC O-3	<u>M. Puiu</u> , O.M. Istrate, V. Mirceski and C. Bala Peptide-Molecular Wires as Conductive Supports in Electrochemical Bioassays	85
AEC O-4	<u>M. Wawrzekiewicz</u> , B. Podkościelna and B. Tarasiuk Starch-Based Adsorbents for Environmental Applications	86
AEC O-5	S. Ayaz, S. Uluçay, A. Üzer, <u>Y. Dilgin</u> , and R. Apak Fabrication of a Novel Colorimetric Paraoxon Ethyl Biosensor Using CUPRAC Reagent as a Chromogenic Reagent	87
AEC O-6	<u>K. Dimic-Misic</u> , A. Brkic, V. Spasojevic-Brkic, E. Barcelo Rodriguez, M. Imani, P. Gane Filtering Efficiency of Pollutants in Heavy-Duty Vehicle Cabins	88
AEC O-7	<u>Z. Zhivikj</u> , D. Stefanovski, J. Dimzova, T. Kadifkova Panovska, L. Petrushevska-Tozi, M. Karapandzova, T. Petreska Ivanovska Rapid GC-MS/MS Analysis of Multiple Pesticide Residues in Cereal-Based Products	89
<i><u>POSTER PRESENTATIONS</u></i>		
AEC P-1	<u>V. Mula</u> , J. Bogdanov, J. Petreska Stanoeva, Z. Zdravkovski Pinpointing the Origin of Volatile Organic Compounds in Urban Air Using Passive Sampling and Gas Chromatographic Methods	90
AEC P-3	<u>J. Krstić</u> , D. Paunović, D. Dimitrijević, B. Stojanović and S. Stojanović Determining the Chemical Quality of Drinking Water in Central Serbia	92
AEC P-4	<u>L. Velkoska-Markovska</u> , M. S. Jankulovska, S. Andonova, Lj. Karakashova, F. Babanovska-Milenkovska RP-HPLC Method for Simultaneous Determination of Some Food Additives in Beverages	93
AEC P-5	<u>L. Velkoska-Markovska</u> and B. Petanovska-Ilievska RP-HPLC Method for the Determination of Malathion in Pesticide Formulation	94
AEC P-6	<u>E. Pecev-Marinković</u> , I. Rašić Mišić, A. Pavlović, S. Tošić, A. Miletić Ćirić and J. Mrmošanin Application of the Kinetic-Spectrophotometric Method for Co(II) Ion Determination in Baby Tea Samples	95
AEC P-7	E. Osmani, I. Dimitrievska, P. Paunovic, K. Atkovska and <u>A. Grozdanov</u> Fly Ash/Chitosan Composites as Adsorbent of Heavy Metal Ions	96
AEC P-8	<u>I. Ćurić</u> , and D. Dolar Opportunities and Challenges in Wastewater Treatment with Membrane Pressure Processes	97
AEC P-9	<u>M. Karadjov</u> , D. Pavlova, M. Marinov, and I. Karadjova Edible Plants and Aquatic Systems in Serpentine Region in Bulgaria	98
AEC P-10	<u>M. Radoičić</u> , A. Kovačević, D. Marković, and M. Radetić Carbonized Jute Sorbent for Oil Cleanup	99
AEC P-11	I. Sofronievska*, M. Stefova, J. Petreska Stanoeva, J. Bogdanov Comparison of Different Approaches for Quantification of Volatile Organic Compounds in Ambient Air	100

AEC P-12	<u>R. Tomaš</u> Volumetric Properties of Solutions of 1-Ethyl-3-Methylimidazolium Chloride Ionic Liquid in Tetraethylene Glycol at Different Temperatures	101
AEC P-13	<u>I. Trajković</u> , M. Sentić, A. Miletić and A. Onjia The Potential Ecological Risk Assessment of Heavy Metals in an Urban Shallow Lake	102
AEC P-14	I. Trajković, <u>M. Sentić</u> , I. Deršek-Timotić, S. Cvetković, Z. Stojanović and A. Onjia Polycyclic Aromatic Hydrocarbons in Dry Herbs: Source Identification, Quantification, and Health Risk Assessment	103
AEC P-15	<u>N. Velinov</u> , J. Mitrović, M. Radović Vučić, M. Kostić, M. Petrović, S. Najdanović, A. Bojić Kinetic and Equilibrium Studies About Sorption Removal of Textile Dye from Water	104
AEC P-16	<u>N. Velinov</u> , J. Mitrović, M. Radović Vučić, M. Kostić, M. Petrović, S. Najdanović, A. Bojić A Comparative Study on The Degradation of Textile Dyes With UV-Activated Peroxide and Peroxydisulfate	105
AEC P-17	<u>Z. Veličković</u> , Z. Bajić, R. Karkalić, M. Nikolić, V. Gujaničić and A. Marinković Investigating the Possibility of Using a Cheap Adsorbent Based on Fly Ash to Remove Neonicotinoid Insecticides from Water	106
AEC P-18	<u>B. Dimovska Gonovska</u> , B. Jordanoska Shishkoska, M. Glusheska, V. Krsteska, T. Stafilov, V. Pelivanoska, M. Srbinska The Impact of Deltamethrine on Copper and Zinc Content in Oriental Tobacco and Soil	107
AEC P-19	<u>K. Milenković</u> , J. Mrmošanin, S. Petrović, S. Tošić, J. Mutić, D. Kostić, and A. Pavlović Evaluation of the ICP-AES Method for Element Determination in Samples of Rosa Dumalis Bechst.	108
AEC P-20	<u>M. Srbinska</u> , J. Klopchevska, V. Rafajlovska, V. Pelivanoska, B. Jordanoska Shishkoska, V. Krsteska Pretreatment of Burley Tobacco Stalks as Raw Material for Bioethanol Production	109
AEC P-21	<u>D. Manojlović</u> , T. Mutić, A. Mijajlović, V.V. Avdin, Elena Korina, V. Stanković, and D. Stanković Design of Cobalt Oxide Functionalized Carbon Paste Electrode for the Detection of Levofloxacin	110
AEC P-22	<u>D. Manojlović</u> , A. Mijajlović, T. Mutić, V.V. Avdin, Elena Korina, V. Stanković, and D. Stanković Boron-Doped Diamond Electrode as an Environmental-Friendly Electrochemical Tool for the Detection and Monitoring of Mesotrione in Food Samples	111
AEC P-23	<u>N. Velevska</u> , B. V. Trifunovska, M. G. Kostadinovska, P. Antovska and J. Lazova Development and Validation of RP-HPLC-UV Method for Determination of Related and Degradation Products of Active Pharmaceutical Ingredient in Tablet Formulation	112

AEC P-24	<u>S. Kirovski</u> , M. Manasova, S. Petrovski, G. Mitrovska and Gj. Petrushevski Development of Analytical Method for Quantitative Determination of Propyphenazone Residues on Manufacturing Equipment	113
AEC P-25	D. Trajković, M. Vukčević, M. Maletić, K. Trivunac, A. Perić Grujić, <u>D. Živojinović</u> Modified Fly Ash for Adsorption of Pharmaceuticals from Water: Chemometric Approach to the Optimization of Adsorption Method	114
AEC P-26	<u>K. Trivunac</u> , N. Aćimović, M. Vukčević, M. Maletić, N. Karić, and A. Perić Grujić Removal Of Cadmium(II) Ions from Water by Polyethylenimine Modified Fly Ash	115
AEC P-27	<u>M. Vukčević</u> , K. Miletić, K. Kostić, M. Maletić, N. Karić, K. Trivunac and A. Perić Grujić Modification of Waste Hemp and Flax Fibers for Removal of Selected Sedative Residues from Polluted Water	116
AEC P-28	B. Dimovska, K.S. Stojanoski, <u>N. Kitanovska</u> , O. Paneva, E. Karadzinska, O. Kuzmanovska, M. Milanovska Use of Spectrometric Techniques in The Identification of Mechanical Impurities in Solid Pharmaceutical Dosage Forms	117
AEC P-29	<u>V. Todorovska</u> , M. Manasova, S. Petrovski, G. Mitrovska, Gj. Petrushevski Cleaning Validation of Primary Packaging Equipment Line in Pharmaceutical Industry	118

PHYSICAL, STRUCTURAL CHEMISTRY, SPECTROSCOPY AND ELECTROCHEMISTRY

ORAL PRESENTATIONS

PSSE O-1	<u>I. Dimitrievska</u> , P. Paunovic and A. Grozdanov Optimization of Biochemical Sensitivity of Screen-Printed Electrodes for Monitoring Traces of Anticancer Drugs	119
PSSE O-2	<u>V. Ivanovski</u> T. Becker, I. Predarska, E. Hey-Hawkins and G.N. Kaluderović IR Investigation of Some Organotin(IV) Compounds Immobilized on Mesoporous Silica	120
PSSE O-3	<u>D. V. Tripković</u> , S. I. Stevanović and D. L. Milošević Synergistic Effects of the Supporting Material and Annealing Temperature on the Performance of Pt Thin Film Catalysts	121
PSSE O-4	<u>S. M. Bakalova*</u> and J. Kaneti Computational Modeling of Solvent Effects on Electronic Spectra of Carbonyl Chromophores	122
PSSE O-5	<u>D.G. Dilgin</u> , K. Vural, S. Karakaya, and Y. Dilgin Sensitive Voltammetric Determination of Salbutamol at Nafion and f-MWCNT Modified Disposable Pencil Graphite Electrode	123
PSSE O-6	<u>Thomas G. Mayerhöfer</u> , Ankit K. Singh, Jer-Shing Huang, Christoph Krafft, Juergen Popp Quantitative Evaluation of IR and Corresponding VCD Spectra	124
PSSE O-7	<u>J. Cerar</u> One Century of the Debye-Hückel Equation: A Simple Explanation of its Thermodynamical Background	125

POSTER PRESENTATIONS

PSSE P-1	<u>I. Dimitrievska</u> , P. Paunovic and A. Grozdanov Comprehensive Structural Analysis of Gamma Irradiated Carbon Nanomaterials	126
PSSE P-2	A. Leniart, M.-M. Dzemidovich, A. Kosińska, B. Rudolf and <u>S. Skrzypek</u> The First Electrochemical Studies of Metallocarbonyl Complexes with Imides	127
PSSE P-3	<u>J. Sela</u> , L. Stojanov, M. Bukleski, A. Reka, S. Dimitrovska-Lazova, V. Mirčeski, S. Aleksavska Cyclic Voltammetry Study of DMAPbI₃ Perovskite Material	128
PSSE P-4	<u>K. Najkov</u> , V. Stefov, V. Koleva, M. Najdoski Structural, Spectroscopic and Thermal Analysis of Hydrogenphosphate Salts Ca₂MH₇(PO₄)₄·2H₂O (M = K⁺, NH₄⁺)	129
PSSE P-5	<u>R. Idrizovska</u> , <u>M. Organdjieva</u> , L. Stojanov and V. Mirceski Oxidation Mechanism of Dopamine and Serotonin Using Cyclic and Square-Wave Voltammetry	130
PSSE P-6	<u>I. Škugor Rončević</u> , M. Buzuk, M. Buljac, J. Dugeč, and N. Vladislavić Micro-Dendritic Electrodeposited Bismuth and Food Coloring Sensing	131
PSSE P-7	<u>S. I. Stevanović</u> , D.L. Milošević, D. V. Tripković, N.D. Nikolić, V. R. Čosović and V. M. Maksimović Design of PtSnZn Nanocatalysts for Anodic Reactions in Fuel Cells	132
PSSE P-8	<u>A. Cvetkovski</u> and <u>E. Drakalska</u> Correlation of H-bonding Distances and Strengths in API Solvates Case Study on Nitrofurantoin and Pyridoxine	133
PSSE P-9	<u>T. Tushev</u> , S. Harizanova, R. Stoyanova and V. Koleva Phosphate-Based Mixed Polyanion Compounds as Promising Electrode Materials for Post-Lithium Ion Batteries	134
PSSE P-10	<u>A. Simović</u> and J. Bajat <i>Pinus Nigra</i> Essential Oil and Its Main Active Components as Sustainable Compounds for Mitigation of Carbon Steel Corrosion	135
PSSE P-11	<u>N.D. Nikolić</u> , J.D. Lović, V.M. Maksimović and S.I. Stevanović Correlation Between Morphology and Structure of Galvanostatically Electrodeposited Tin Dendrites	136
PSSE P-12	<u>J.D. Lović</u> , N.D. Nikolić, P. M. Živković, M. Stevanović Facile Synthesis of Sn-Pd Catalysts with High Performances for Ethanol Electro-Oxidation in Alkaline Medium	137
PSSE P-13	<u>V. S. Cvetković</u> , N. M. Petrović, D. Feldhaus, L. Prasakti, B. Friedrich, J. N. Jovičević Greenhouse Gas Emission from The Rare Earth Metals Electrolysis	138
PSSE P-14	<u>V. S. Cvetković</u> , N. D. Nikolić, M. G. Košević, T. S. Barudžija, S. B. Dimitrijević and J. N. Jovičević Copper Electrodeposition onto Palladium from a Deep Eutectic System Based on Choline Chloride	139
PSSE P-15	<u>D. L. Milošević</u> , S. I. Stevanović and D. V. Tripković Formic Acid Electrooxidation on Cr-Supported Platinum Thin Film Catalyst	140

PSSE P-16	<u>I. Dimitrievska</u> , M. Endekovska, P. Paunovic and A. Grozdanov Graphene-Based Biosensor for Detection of Anticancer Agent Doxorubicin Within a Simulated Biological Matrix	141
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BIOTECHNOLOGY AND FOOD TECHNOLOGY

ORAL PRESENTATIONS

BFT O-1	<u>E. Bartkiene</u> , E. Tolpeznikaite, V. Bartkevics, A. Skrastina, R. Pavlenko, M. Ruzauskas, V. Starkute, E. Zokaityte, D. Klupsaite, R. Ruibys and J. M. Rocha The Changes in Bioactive Compounds During the Fermentation of Spirulina	142
BFT O-2	T. Marinkovic, M. Stamenovic and D. Brkic Shaping the Future of the Food Production by CRISP/Cas9 Gene Editing	143
BFT O-3	<u>M. Jaukovic</u> , A. Popovic, P. Maksic, D. Markovic, P. Drobnyak and V. Radivojevic Fate of Deoxynivalenol During the Production Process of Bakery Products	144

POSTER PRESENTATIONS

BFT P-1	<u>A. Chadikovski</u> , A. Nagy, J. Klopchevska, E. Velickova Nikova and V. Rafajlovska Physicochemical Characteristics of Scotta from Different Whey Cheese Types	145
BFT P-2	<u>A. Chadikovski</u> , A. Nagy, J. Klopchevska, E. Velickova Nikova and V. Rafajlovska Effect of The Heat Treatment Time on the Whey Cheese Yield	146
BFT P-3	<u>I. Cvetkovi</u> <u>kj Karanfilova</u> ; J. Gjorgievska; O. Gigopulu; M. Karapandzova; V. Stoilkovska Gjorgievska; A. Trajkovska; I. Davkova; S. Kulevanova; G. Stefkov Assessment of Silymarin Content in Plant Material and Extracts Using HPLC and Raman spectroscopy	147
BFT P-4	<u>N. Šekuljica</u> , J. Mijalković, S. Jakovetić Tanasković, M. Korićanac, I. Gazikalović, Z. Knežević-Jugović Testing The Quality of White and Green Leaf Proteins Using Mixolab™ for Applications in Bakery Products Formulations	148
BFT P-5	<u>J. Mijalković</u> , <u>N. Šekuljica</u> , S. Jakovetić Tanasković, N. Luković, N. Pavlović, J. Bakrač, and Z. Knežević-Jugović Pumpkin Leaf-Isolated RuBisCo as a Protein Source for Bioactive Peptides	149
BFT P-6	<u>M. Arizanova</u> , E. Velickova Evaluation of Anthocyanins Extracted from Black Rice, Acai and Purple Cabbage Using Uv-Vis Spectroscopy	150
BFT P-7	<u>I. Milenković</u> , Yiqun Zhou, S. Z. Spasić, Roger M. Leblanc, and K. Radotić Effect of Orange-Carbon Dots on Plants' Antioxidative Response in Green Beans Cultivated in the Soil	151
BFT P-8	<u>M. Nikolić</u> , S. Petrović, M. Mitić, J. Mrmošanin, and A. Pavlović Stability of Cyaniding-Derivatives in Homemade Raspberry Jams	152
BFT P-9	<u>M. Arizanova</u> , D. Kostadinova, B. Ristovski, E. Velickova Sensory Analysis of Meat Analogues – Veggie Burgers	153

BFT P-10	<u>S. Stamenković Stojanović</u> , S. Mančić, D. Cvetković, M. Malićanin, B. Danilović and I. Karabegović Volatile Profile of Grašac Wines Produced with Different Commercial Inactivated Yeast Derivatives	154
BFT P-11	<u>D. Kostadinova</u> , D. Doneva Sapceska and M. Petrusheska Organoleptic Characteristics of Laboratory Brewed Herbal Beers	155
BFT P-12	<u>D. Burgu</u> , D. Dimitrovski, M. Temkov, and E. Velickova Nikova Enhancing Strawberry Shelf Life with Essential Oil-Infused Edible Coating	156
BFT P-13	<u>I. Kostoska</u> , M. Stojcevski, D. Dimitrovski* and S. Kuvendziev Improving Lycopene Extraction from Tomato Skins Through Enzymatic Treatment	157

POLYMERS AND POLYMER MATERIALS

ORAL PRESENTATIONS

POL O-1	<u>A. Ivanoska-Dacikj</u> , P. Makreski, N. Geskovski, J. Karbowniczek, U. Stachewicz, N. Novkovski, I. Ristić, and G. Bogoeva-Gaceva Evaluation of Overall Properties and Cytotoxicity of PEO/rGO Scaffolds for Potential Use in Tissue Engineering	158
POL O-2	<u>B. Podkościelna</u> , M. Wawrzkievicz, and B. Tarasiuk Synthesis, Spectroscopic and Thermal Characterization of New Polymeric Microspheres Based on Starch and Acrylic Monomers	159
POL O-3	<u>M. Prosheva</u> , R. Tomovska, and J. Blazevska Gilev Protective Waterborne Coating Based on G/CNT Hybrid Filler	160
POL O-4	<u>A. Puszka</u> , J. Sikora, and A. Nurzynska Influence of The Type of Soft Segment on Selected Properties of Polyurethane Materials for Biomedical Applications	161
POL O-5	<u>J. Kamov</u> , and <u>Zh. Serafimoski</u> The Effects of Component Changes Within Pultruded Epoxy Resin-Based Products	162

POSTER PRESENTATIONS

POL P-1	<u>Bulatović</u> , B. Marković, T. Tadić, A. Nastasović, M. Ilić, D. Randjelović and N. Nedić Determination of Antimicrobial Activity Of Copper Activated Macroporous GMA Based Copolymer	163
POL P-2	<u>N. Đorđević</u> , A Božić, A Sknepnek, N Curcic, G Stankov and A Janićijević Optimizing Precipitation Conditions of BNC/Fe₃O₄ Composites	164
POL P-3	<u>A. Petanova</u> , R. Tomovska, E. González, M. Paulis, J. B. Gilev Production of Thermochromic Poly(Methylmetacrylate/Butyl Acrylate) Based Coatings Via Miniemulsion Polymerization	165
POL P-4	B. Samardjioska Azmanoska, V. Velkovska, A. Pizhov, S. Risteska, S. Samak, B. Kostadinoska Determination of Parameters for Obtaining Resin Film for Production of Prepreg by Hotmelt Procedure	166

POL P-5	<u>T. Skalar</u> , P. Štukovnik, M. Marinšek Characterization of the Thermal Behaviour of a Paraffin-based Phase Change Material	167
POL P-6	<u>Škugor Rončević</u> , B.-M. Kukovec, M. Buzuk, M. Buljac, N. Vladislavić and J. Dugeč An Electrochemical Dopamine Sensor Based on a Cobalt(II) Coordination Polymer, {[Co(1,2-Bpe)₂(H₂O)₂]²⁺]_N-Modified Electrode	168
POL P-7	<u>S. Maletić</u> , D.D. Cerović, I. Petronijević, M. Milić and N. Jović Orsini Interfacial Polarization and Dielectric Properties of Epoxy/Graphite Flakes Composites	169
POL P-8	<u>P. Miladinova</u> , and P. Najdenova-Marinova The Synthesis and Photostability of Some New 1,8-Naphthalimide Derivative for Fluorescent Polymers	170
POL P-9	<u>K. Młynarczyk</u> , B. Podkościelna, M. Jaszek Study of the Structure and Antimicrobial Properties of Composites based on (met)acrylates	171
POL P-10	<u>M. Prosheva</u> , A. Toteska and J. Blazevska Gilev Synthesis of Lignin-Based Polymer Coatings by Miniemulsion Polymerization	172
POL P-11	<u>M. Prosheva</u> , B. Ozmen-Monkul, R. Tomovska, G. Gumus, D. K. Taskin, and J. Blazevska Gilev Determination of the Optical Band Gap Energies of rGO/Metal Phthalocyanine/Polymer Nanocomposites	173
POL P-12	<u>M. Prosheva</u> , M. Sencheva Petrevska and V. Dimova Prediction of the Refractive Index of Polymers Using QSAR	174
POL P-13	<u>M. Kubin</u> and A. Bužarovska Nanocomposite PVDF/ZnO Piezoelectric Foams	175
POL P-14	<u>I. Stefanović</u> , E. Džunuzović, A. Dapčević, B. Marković, T. Tadić, S. Bulatović, and J. Džunuzović Viscoelastic Properties of Polycaprolactone Based Polyurethane Networks	176
POL P-15	<u>B. Marković</u> , I. Stefanović, T. Tadić, Z. Sandić, S. Bulatović, A. Nastasović and A. Onjia Kinetic and Isotherm Non-Linear Study of Cr(VI) Sorption onto Amino-Modified Macroporousgma Based Copolymer	177
POL P-16	<u>T. Tadić</u> , B. Marković, V. Pavlović, S. Bulatović, A. Nastasović, and A. Onjia Synthesis and Characterization of Magnetic Molecularly Imprinted Polymer for Aniline Recognition	178
POL P-17	<u>A. Puszka</u> , K. Mikon and J. Sikora Investigation of the Effect of Introducing Siloxane Groups into the Polymer Chain on Selected Properties of Polyurethane Materials	179
POL P-18	<u>M. Prosheva</u> , A. Toteska and J. Blazevska Gilev UV Protective Polymer Coatings Based on Lignin Filler	180

CHEMICAL ENGINEERING

ORAL PRESENTATIONS

- CE O-1 N. Barrientos, F. Diaz 181
Application of Nuclear Measurement Technologies as Tools to Characterize Mineral Processing Operations

POSTER PRESENTATIONS

- CE P-1 D. Z. Trotter Z. B. Todorović, D. R. Đokić-Stojanović, B. S. Đorđević, and V. B. Veljković 182
Glycine as a Safe Purification Agent of Crude Biodiesel Produced from Inedible Oil Under Mild Conditions
- CE P-2 A. Sinanova, L. Atanasovska, M. Davcheva Jovanoska, E. Karadzinska and O. Paneva 183
State of the Art Process and Process Controls for Production of Concentrates for Haemodialysis
- CE P-3 S. S. Mladenović, I. M. Savić, I. M. Savić Gajić 184
The Influence of Extraction Techniques on The Antioxidant Potential of Chaga Mushroom Extracts
- CE P-4 M. Ognjanović, M. Radović, M. Mirković, S. Vranješ-Đurić, B. Dojčinović, D. Stanković and B. Antić 185
Engineering Multi-Core Flower-like Magnetic Nanoparticles with High Intrinsic Loss Power
- CE P-5 M. Ognjanović, T. Stanojković, B. Dojčinović, M. Radović, M. Mirković, D. Janković, S. Vranješ-Đurić, and B. Antić 186
Radiolabeled Surface-modified Single-core (Mg, Fe)₃O₄ Colloidal Nanoparticles as Vectors in Radionuclide Therapy of Cancer

TEXTILE ENGINEERING

POSTER PRESENTATIONS

- TE P-1 M. Miljkovic, V. Miljkovic, D. Trajkovic 187
Examination of the Wavelength Dependence of K/S Values for Samples Dyed in a Two-Component System
- TE P-2 N. Čirković, S. Kapuši, D. Trajković, N. Stamenković, T. Šarac, J. Stepanović 188
The Influence of the Characteristics of Knitwear in Parts of Classic Socks on Some Usage Properties
- TE P-3 D. Marković, J. Petkovska, N. Mladenovic, M. Radoičić, D. Rodriguez-Melendez, M. Radetić, J. C. Grunlan and I. Jordanov 189
Multifunctional Cotton Impregnated with Multilayer Chitosan/Lignin Nanocoating and Ag Nanoparticles
- TE P-4 A. Ivanovska, M. Milošević, J. Ladarević, B. Dojčinović, T. Matić, N. Barać and M. Kostić 190
Sodium Periodate Oxidation of Raw Jute Fabric – A Novel Approach for Tuning the Jute Structure and Properties

EDUCATION

ORAL PRESENTATIONS

- EDU O-1** Bojan Šarac, San Hadži and J. Cerar **191**
Computer Generated and Graded Online Physical Chemistry Exam

POSTER PRESENTATIONS

- EDU P-1** A. Naumoska, S. Aleksovska **192**
Identification of Difficulties and Misconceptions in the Study of Organic Chemistry in High School
- EDU P-2** R. Karkalić, Z. Veličković M. Stojičić, S. Cvetanović^c P. Otrisal, and S. Florus **193**
Implementation of New Methodology of Testing of Body Cooling Systems into the Education Process
- EDU P-3** L. Atanasovska, A. Sinanova, M. Davcheva Jovanoska, E. Karadzinska, S. Spirovska Burchevska and O. Paneva **194**
The Importance of Quality, Safety and Environmental Aspects in Chemical Industry
- EDU P-4** D. Zlatković, M. Đorđević Zlatković, N. Radulović **195**
Problem-Solving with Python: Modeling of Lanthanide Shift Reagent Complexes
- EDU P-5** Ž. Zdravković, S. Simić, G. Zajic, F. Krivokapic and J. Pavlović **196**
Analysis of the Application of Information Technologies in Teaching

ICTM P-10

Structural Characteristics and Adsorption Properties of Alkali Activated Blends Ashes/Metakaolin

N. Mladenović Nikolić,^a S. Knežević,^a M. Ivanović,^a M. M. Mirković,^a M. Maletić,^b L. M. Kljajević^a and K. V. Trivunac³

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The aim of this paper is to show the possibility of using waste materials, blends of (wood ash, fly ash, from thermal power plant, and metakaolin) for the production of alkali activated materials that can be used to purify wastewater from different kinds of pollutants such as heavy metals. Heavy metals are toxic, especially cadmium, so they must be removed from wastewater to prevent or minimize contact with the environment and humans. The synthesis of the alkali activated materials was performed by mixing solid precursors with a liquid alkali activator. Two- and three-component systems of wood ash, fly ash and metakaolin (wood ash/fly ash, wood ash/metakaolin, fly ash/metakaolin and wood ash/fly ash/metakaolin) were used as precursor materials. The alkali activator solution was a mixture of sodium silicate solution and sodium hydroxide solution of concentrations (6M and 12M). The characterization of alkali activated materials was studied by X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, Scanning electron microscopy and energy-dispersive X-ray spectroscopy (SEM/EDS). XRD measurements of investigated samples showed a characteristic halo between 18° and $35^\circ 2\theta$ with a dominant crystal phase of quartz. FTIR spectroscopy showed that the main vibration band of all investigated samples appeared between 1037-996 cm^{-1} , and corresponds to Si-O-Si/Si-O-Al bands. SEM/EDS analysis was used to determine the microstructure of the samples. The adsorption efficiency of the investigated alkali activated materials for removing cadmium ions from aqueous solution was tested under different conditions: initial concentration of cadmium ions in the range of 20-100 mg/l, pH values from 3 to 7 and mass of adsorbents from 0.02-0.05 g.

Keywords: wood ash, fly ash, metakaolin, alkali activated materials, adsorption, cadmium