ACADEMY OF SCIENCES AND ARTS OF THE REPUBLIC OF SRPSKA

ALMA MATER EUROPAEA ECM
THE UNIVERSITY FOR LEADERSHIP

ТЕХНИЧЕСКИ УНИВЕРСИТЕТ ГАБРОВО

XIII МЕЂУНАРОДНИ НАУЧНИ СКУП
САВРЕМЕНИ МАТЕРИЈАЛИ 2020

ПРОГРАМ РАДА
И
КЊИГА АПСТРАКАТА

XIII INTERNATIONAL SCIENTIFIC CONFERENCE
CONTEMPORARY MATERIALS 2020

PROGRAMME
AND
THE BOOK OF ABSTRACTS

Бања Лука, 11. септембар 2020. године
Banja Luka, 11th September, 2020

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ОРГАНИЗАТОР НАУЧНОГ СКУПА

Академија наука и умјетности Републике Српске

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Alma Mater Europaea

Технички универзитет Габрово

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Министарство за научнотехнолошки развој, високо образовање и информационо друштво

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ПРОГРАМ
13. МЕЂУНАРОДНЕ НАУЧНЕ КОНФЕРЕНЦИЈЕ „САВРЕМЕНИ МАТЕРИЈАЛИ“

Сходно тренутној епидемилошкој ситуацију која влада услијед пандемије вирусом корона Конференција ће се, ове године, одржати на сљедећи начин:

- Уводни говори предсједника АНУРС-а академика Рајка Кузмановић, министра за научнотехнолошки развој, високо образовање и информационо друштво мр Срђана Рајчевића и предсједника Организационог и Научног одбора академика Драгољуба Мирјанића биће доступни у облику видео записа на сајту АНУРС-а www.anurs.org и сајту Конференције www.savremenimaterijali.info.
- Пленарна предавања биће презентована на web sajtu www.savremenimaterijali.info у виду power поинт презентације или видео представљања рада,
- Постер презентације биће такође доступне на истом сајту са контакт емаил адресама аутора како би се могла остварити комуникација између аутора радова и Комисије за оцјену постер презентација,
- Књига апстраката и Програм рада биће доступни на сајту Конференције.
- Приступ свим презентацијама биће омогућен дужи временски период.

На овакав вид рада одлучили смо се како бисмо омогућили учесницима да представе резултате својих истраживања и упознају се са радом и резултатима истраживања својих колега, након чега могу остварити и лично комуникацију путем е-маил адреса која ће бити назначене. Радови у цјелини ће, као и претходних година, након рецензирања бити штампани у зборнику радова „Савремени материјали” или часопису „Contemporary Materials”.

PROGRAMME
OF THE 13TH INTERNATIONAL SCIENTIFIC CONFERENCE CONTEMPORARY MATERIALS

According to the epidemiological situation around caused by corona virus pandemic this year's Conference is going to be held as following:

- Introductory speech of the president of ASARS academician Rajko Kuzmanović, ministry of scientific-technological developement, higher education and information technology mr Srđan Rajčević and president of Organization and Scientific Board academician Dragoljub Mirjanić are going to be presented at the web site www.savremenimaterijali.info.
- Plenary speakers presentations are going to be available at the same web site in a form of power point presentation or audio presentation.
- Poster presentations are going to be available in the same form, with e-mail addresses to ensure communication among participants and members of commissions.
- The Book of Abstracts and Program will be presented at the Conference site.
- Access to all presentation will be possible for a longer period of time.

We have decided on this kind of work in order to enable the participants to present the results of their research and get acquainted with the work and research results of their colleagues, after which they can communicate in person via e-mail addresses that will be indicated. As in previous years, the papers will be published in the collection of papers "Contemporary Materials" or the journal "Contemporary Materials" after review.

ПЛЕНАРНА ПРЕДАВАЊА
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1. Slavko Mentus
   The role of batteries in near-future energetics

2. Stane Pejovnik, Genorio Boštjan
   Lithium – boron system materials – current status

3. Momir Đurović
   Energy for all: today and tomorrow

4. Nenad Filipović
   SILICOFCM project: Computer simulation of hypertrophic cardiomyopathy

5. Plamen Tsankov
   New Mono-SI, CDTE and Cigs grid-connected photovoltaic power plants in the technology park at technical university of Gabrovo, Bulgaria

6. Ljubomir Majdandžić
   Ambition of the European green deal

7. Vojislav Mitić, Goran Lazović, Dušan Milošević, Elizabeta Ristanović, Dragan Simeunović, Mimica Milošević, Hans Fecht, Branislav Vlahović
   Coronavirus trajectory and interval fractal method in Brownian motion

8. Duško Dudić
   LDPE/ZIF-8 composite as a cathode in an electron battery

9. Predrag Dašić
   Development of software systems for reliability analysis of the components technical system

ПОСТЕР ПРЕЗЕНТАЦИЈЕ
POSTER SESSION

1. Olivera Klisurić, Ivana Marjanović, Predrag Ristić, Tamara Todorović, Predrag Vulić, Nenad Filipović
   Structure, topology, photocatalysis and photoluminescence of 1D and 2D silver-based coordination polymers

2. Branko Škundrić, Rada Petrović, Jelena Penavin-Škundrić, Dragana Gajić, Darko Bodroža
   Removal of hexavalent chromium CR (VI) from aqueous solution by adsorption onto kaolinite

3. Raul Turmanidze, Predrag Dašić, Giorgi Popkhadze
   Review of the development of micro-drills for drilling small holes in modern composite materials

4. Silvester Bolka, Teja Pešl, Rebeka Lorber, Tamara Rozman, Rajko Bobovnik, Miroslav Huskić, Blaž Nardin
   From recycled polypropylene to engineering plastic composite via addition of waste paper

5. Yueh-Ying Chou, Po-Yu Chen, Vojislav V. Mitić, Goran Lazović, Mimica Milošević, Jana Kotnik, Dušan Milošević
   Bio-ceramics porosity and fractal nature

6. Suzana Apostolov, Borko Matijević, Gorana Mrđan, Đenđi Vaštag
   Application of chromatographic parameters in the assessment of amide derivatives' biological potential

7. Anja Mirjanić, Uroš Prah, Julian Walker, Oana Condurache, Andreja Benčan, Tadej Rojac, Marian Grigoras, Hana Uršič
Local piezoelectric and magnetic properties of (BIO.88Gdo.12)-FeO3 ceramics

8. Violeta Nikolić
Observation of Fe3O4→α-Fe2O3 phase transformation at low temperature

9. Milesa Srećković, Aleksander Kovačević, Aco Janićijević, Suzana Polić, Zoran Nedić, Zoran Stević, Sanja Jevtić, Milovan Janićijević
Laser techniques and couplings with other techniques in contemporary problem solving in theory and practice

10. Biljana Zlatičanin, Branislav Radonjić
Modelling of phase equilibria in AlCu5Mg1 alloys

11. Marica Dugić, Branko Despotović, Tatjana Botić, Pero Dugić
Application of synthetic esters in formulations of industrial lubricants

12. Marija Riđošić, Katarina Crljenić, Mihael Bučko, Milorad Tomić, Jelena Bajat
Ultrasound assisted electrodeposition of Zn-Mn-Al2O3 nano-composite coatings

13. Marija Riđošić, Aleksandra Josipović, Milorad Tomić, Miomir Pavlović
The influence of the anodic oxidation on corrosion stability of Nb coatings produced by physical vapour deposition

14. Svetlana Stevović, Žarko Nestorović
The risks of nanotechnologies utilization in process of water use

15. Irena Havreljuk, Aleksandra Šinik, Tatjana Botić, Pero Dugić
Development and application of composite waterproofing materials

16. Svjetlana Sredić, Ljiljana Tankosić
Effect of pH conditions on goethite behavior in the presence/-absence of different dispersants

17. Dragoljub Mirjanić, Darko Divnić, Tomislav Pavlović, Ivana Radonjić, Esad Jakupović
Application of solar simulators in PV technologies

18. Aleksandra Šmitran, Dragana Gajić, Ljiljana Božić, Dijana Jelić
Excellent antimicrobial activity of novel nanocomposites (pyrophyllite clay based) modified with silver

19. Zoran Ivić
Dispersive effects in self-induced transparency soliton propagation

20. Stevo Jaćimovski, Jelena Lamovec, Siniša Vučenović, Jovan Šetrajčić
Thermal conductivity of graphene monolayer in the framework of Debaye and callaway models

21. Mirjana Radanović, Ljiljana Vojinović-Ješić, Marko Rodić, Vukadin Leovac
Synthesis and structure of Iron(III) complex with 2-acetylpyridine-aminoguanidine

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23. Nemanja Vuković, Vladimir Biočanin, Đorđe Antonijević, Vukoman Jokanović, Katarina Kalevski
In-vitro solubility of different experimental calcium-aluminate cements and MTA

24. Zoran Rajilić, Enes Škrgić, Mirjana Vučić
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25. Dragoljub Mirjanić, Tomislav Pavlović, Ivana Radonjić, Lana Pantić, Darko Divnić, Galina Sazhko
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26. Milan Pantić
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Nanomaterials for drug delivery

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Treatment of crowding by extraction and fixed appliances – case report

80. Gordana Simić, Sara Marmat
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82. Stojan Srbinoski
Engineering practice and ideas solutions in developing flood plans

83. Veljko Đukić, Biljana Đukić
Sustainable development and integrated water management of the Republic of Srpska

84. Biljana Bespaljko
Economic contribution from waste generated in the manufacturing industry

A B S T R A C T S

PLENARY PRESENTATIONS

THE ROLE OF BATTERIES IN NEAR-FUTURE ENERGETICS

Slavko Mentus
Serbian Academy of Sciences and Arts, Belgrade, Serbia

Abstract: Since the first oil crysis in early 70-ties, the electrochemists strive to develop a chemical power source able to replace the liquid fossil fuels in trafic. Noticeable success was achieved in the decade 1980-1990. Thanks to a new class of materials – intercalate compounds, a new battery called lithium-ion battery was commercialized, having much higher energy density than its predecessors. In this work the origin of its high energy density is explained. The emergence of new battery supported effectively the expansion of use and the development of portable electronics – mobile phones, lap-top calculators tablets etc. Since 2010, connected to the global intentions to prevent climate changes, the batteries received the role of the energy sources of electric cars. Recently, connected to the rising use of renevable energy sources known to suffer of changeable intensity, batteries take also the role of grid energy storage, having the function to smooth the disturbances in grid voltage. All this caused huge rise in batteries usage, and poses the question about the availability of global resources of lithium, cobalt and nickel needed for battery production The recent forecast is that these resources will be exhausted very soon in the decade 2030-2040. Thus, there is a strong need to search for new battery types, to maintain, at least partly, available lithium resources for more demanding applications. As a part of solutions having real perspective, the development of sodium-ion battery is crrently in progress. In that sense, some perspective anode and cathode materials were considered.

Key words: climate changes, intercalate compounds, Li-ion battery, metal resources, Na-ion battery.

LITHIUM – BORON SYSTEM MATERIALS – CURRENT STATUS

Stane Pejovnik, Genorio Boštjan
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Abstract: Preparation of Li-B alloys as anode material for production of lithium batteries has been extensively studied. (1,2) However, many questions re-

mained unexplained. Some ambiguities also remained regarding the existence of a LiB_3 compound and the dissolution of boron in lithium melt. Preparation of Li-B alloys is very challenging, because it is carried out at relatively high temperatures, where molten Li is highly reactive. An argon-filled dry-box, containing less than 0.1 ppm of oxygen and water, was used in synthesis protocol. Li-metal and crystalline boron were heated in electric furnace in a pure iron crucible.

The processes for the preparation and characterization of Li-B alloys are described in detail in previously published publications (3,4). It is interesting that in the present time most of researchers avoid the classic metallurgical preparation of Li-B alloys. There are some documented procedures using metallurgical approaches, which significantly differs from ours (5), due to a highly demanding experimental work.

In the present work we report on the development of materials that originate from Li-B system and could lead to the preparation and application of 2-D boron materials – i.e. borophenes – graphene analogs. Borophenes are promising new class of materials, due to their exceptional physical and mechanical properties, which offer a wide range of applications, especially for energy conversion and storage devices. It is hard to say that borophenes have been synthesized as pure 2-D material. We believe that Li-B alloys, which we began to develop in the early 1990s can be used for this purpose (1,2).

Using extensive research work and quantum chemical calculations (*ab initio* MO) we explained the mechanisms of formation of Li-B alloys and so-called "dissolution" of the boron in the melt of metalic lithium (6,7 and 8). We found that the LiB_3 composition is not actually an alloy, but rather interstitial solid Li solution, which is incorporated into B_{12} interstices in the β-rombohedral boron. We also found that Li incorporation increases the unit cell of the boron which then causes local disorder and micro stress in its crystal lattice. Using X-ray powder diffraction, we have shown that due to this stress, the surface of the crystalline boron peels off, which leads to the formation of layered boron material.

We prepared Li-B alloy, by metallurgical process and with H_2O/HCl(aq.) solution remained lithium was etched away. This material was then purified and exfoliated in water suspensions, filtered and dried in vacuum oven at elevated temperature. Detailed synthesis procedure will be published elsewhere. The resulting material was then morphologically characterized by scanning electron microscopy (SEM) and transmission electron microscopy (TEM), chemically with energy-dispersive X-ray spectroscopy (EDS), and Electron energy loss spectroscopy (EELS). The material was further characterized by powder XRD, evolved gas analysis (EGA), Brunauer-Emmett-Teller analysis (BET) and electrochemical methods.

Within the material we found layered, amorphous, material which is stable at relatively high temperature and could be borophene. We tested this material as an anode in Li-ion batteries, as a supercapacitor and as an additive to spectrally se-

lective coatings for concentrated solar power plants (CSPs). All results confirmed unusual behavior of material.

Key words: Li-B alloy, Borophene, Li ion batteries, Electrochemistry.

ENERGY FOR ALL: TODAY AND TOMORROW

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Abstract: Most of the energy we capture for use on Earth comes from the nuclear reactions on the Sun. Changes in energy systems have resulted due to the different periods of technological, economic and social advancements taking place by many actors at diverse locations. Energy systems are structured by many resources, technologies, users and infrastructures, driven by economics, resource availabitiies, public policies and social behaviour. Energy is one of the the clearest examples of geopolitical issue. This paper will present possibilities that new energy technologies should provide at global level as well as how to deal with an unexpected events like, for example COVID 19, trade war, labor dispute, regulatory changes, supplier bankruptcy by transforming traditional linear supply chain model into digital supply networks (DSNs).

Key words: energy, technology, geopolitical issues, DSNs.

SILICOFCM PROJECT: COMPUTER SIMULATION OF HYPERTROPHIC CARDIOMYOPATHY

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Abstract: In H2020 project SILICOFCM Familial cardiomyopathies (FCM) as most commonly diagnosed disease of the heart is investigated and software platform has been developed. Hypertrophic cardiomyopathy (HCM) is characterized by the thickening of the left ventricular muscle of the heart, and it is a major cause of sudden cardiac death. Many patient suffering from HCM remain asymptomatic with normal life expectancy, but unfortunately some of them may die suddenly of cardiac arrest with no previous signs. There are several different phenotype of FCM or HCM disease where heart suffers from structural changes such as hypertrophy, cardiomyo-

cyte disarray, fibrosis, as well as ion-channel dysfunction. This may create an unstable electrical field which could lead to arrhythmia.

Computer simulations are used to design and safely test new products in virtual patients. We simulated different QRS morphology and T waves for different HCM cases. Data from patients are imported from DICOM images and 3D reconstruction for left and right ventricle has been applied. We found that increased wall thickness could not explain the QRS and T wave abnormalities observed in different patient groups. Impact of tissue microstructure on the ECG, and evaluated the effect of fiber disarray and altered conduction velocity due to fibrosis or hypertrophy in various regions of the myocardium was examined.

The influence of altering the conduction system by modifying the activation sequence of the ventricles, and the coupling between the Purkinje endocardial layer and the myocardium was also investigated. We believe that with SILICOFCM software tool project we will give FCM or HCM personal medicine prediction using finite element, data mining and image processing tools in order to make risk stratification for each patient personally.

Key words: Computer simulation, hypertrophic cardiomyopathy.

NEW MONO-SI, CDTE AND CIGS GRID-CONNECTED PHOTOVOLTAIC POWER PLANTS IN THE TECHNOLOGY PARK AT TECHNICAL UNIVERSITY OF GABROVO, BULGARIA

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Abstract: A three new roof-mounted 10 kWp grid-connected photovoltaic (PV) power plants have been constructed in the Technology Park at the Technical University of Gabrovo, Bulgaria, as part of a project "Competence Center – Intelligent Mechatronic, Eco and Energy Saving Systems and Technologies". Three different types of technology of the PV modules have been used: monocrystalline silicon (mono-Si), cadmium telluride (CdTe) and copper indium gallium selenide (CIGS).

With the new three power plants, together with the existing photovoltaic power plants in TU-Gabrovo with modules of amorphous silicon and poly-crystalline silicon, 5 different photovoltaic materials can be tested simultaneously. A small 500 Wp mono-Si photovoltaic thermal hybrid solar collectors (PVT) PV system is also constructed.

The power plants are equipped with a system for monitoring the meteorological and electrical operating parameters, which measures, displays and stores data on

solar radiation, temperature, wind speed, currents, voltages, and electrical power of each power plant.

The technical characteristics of the components of the PV plants are given in the paper. Schemes with basic wiring diagram, disposition of the three PV subsystems on the roof of the building at the technology center are presented. Initial comparative data from software for monitoring of meteorological and electrical operating characteristics of the three different types of PV subsystems are shown.

Key words: photovoltaic module, mono-Si, CdTe, CIGS, grid-connected photovoltaic power plant, monitoring system, meteorological and electrical operating characteristics, smart solar logger.

AMBITION OF THE EUROPEAN GREEN DEAL

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Abstract: The European Green Deal is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. Since it will bring substantial change, active public participation and confidence in the transition is paramount if policies are to work and be accepted. A new pact is needed to bring together citizens in all their diversity, with national, regional, local authorities, civil society and industry working closely with the EU's institutions and consultative bodies. To deliver the European Green Deal, there is a need to rethink policies for clean energy supply across the economy, industry, production and consumption, large-scale infrastructure, transport, food and agriculture, construction, taxation and social benefits. To achieve these aims, it is essential to increase the value given to protecting and restoring natural ecosystems, to the sustainable use of resources and to improving human health. This is where transformational change is most needed and potentially most beneficial for the EU economy, society and natural environment. The EU should also promote and invest in the necessary digital transformation and tools as these are essential enablers of the expected changes.

Key words: European Green Deal, emissions of greenhouse gases, resource use, clean energy supply, protection and restoration natural ecosystems, sustainable use of resources, better human health, digital transformation.

CORONAVIRUSTRAJECTORY AND INTERVAL FRACTAL METHOD IN BROWNIAN MOTION

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Abstract: The global Coronavirus epidemic, almost took the lives of about 800.000 people all over the world, resulting in serious medical, socio-political-economic, psychological, terroristic, anti-terroristic impacts which are changing the civilization. Many questions about aerosol transmission and Coronavirus, within the virology, epidemiology, molecular biology, as well as aerosol science have to be researched. It is important to help humanity to prepare more infections for the future. Also, the terroristic aspects of this virus are very dangerous. In that sense is very important to develop different knowledge about this virus to prognose possible further negative infects. Our research report helps solve different Covid19 phenomena. Here, we provide more knowledge regarding virus motion, which has a Brownian motion character. Nowadays is very important to predict the attached directions on the organ's cells. We established control over corona kinetics by fractal nature analysis. We developed the method and procedure to control the virus motion direction to predict the Corona trajectory. There is a problem of the recording this motion from the point of view magnification and resolution because the virus size is more than ten times less than bacterizes. From worldwide experimental data, we resolved by time interval method and fractals, the points on the Coronavirus trajectory. The first time, we defined diagrams on the way to control Brownian chaotic motion as a bridge between these order to control disorder. This in-lighting new frontier for research on the way to complete control on this virus biophysical-mathematical aspects case.

Key words: Coronavirus, Brownian motion, fractals time interval method, aerosol biophysical phenomena, anti-terorism.

LDPE/ZIF-8 COMPOSITE AS A CATHODE IN AN ELECTRON BATTERY

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Abstract: The problem of electricity storage is today the most significant limiting factor for the use of autonomous electric vehicles and the wider use of electricity from the solar panels. Rechargeable lithium batteries are currently the best choice for storing electricity for most industrial needs and products.

Environmental and safety risks associated with this type of battery, their price and relatively short life are the reasons why great efforts are being made today in the search for a more suitable type of battery.The idea of a battery in which the processes of charging and discharging take place by the movement of electrons, not ions, is relatively new.

This article contributes to the development of that idea. A significant improvement in the electron deposition characteristics in a non-polar polymer (linear low density polyethylene - LDPE) was presented, which was achieved by adding a small proportion (4%) of the non-polar metal-organic complex (ZIF-8).

Key words: electron battery; energy storage; electron traps; polymers.

DEVELOPMENT OF SOFTWARE SYSTEMS FOR RELIABILITY ANALYSIS OF THE COMPONENTS TECHNICAL SYSTEM

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Abstract: The reliability of the technical system is defined as its ability to successfully perform its functions and maintain the value of the exploitation parameters, within the prescribed and defined limits under certain conditions and within a given time interval. The paper presents the development of two software systems for reliability analysis of technical system components, as follows: RATSC-CTD (Soft-

ware system for Reliability Analysis of Technical System Components on the Basis of Choice of Theoretical Distribution According to Characteristics of Theoretical Distributions, which in the best way Approximate Experimental Data) and RATSC-CA (Software system for Reliability Analysis of Technical System Components on the Basis of Choice of Theoretical Distribution Based on Comparative Analysis, which in the best way Approximate Experimental Data), which have been developed and written in FORTRAN and C++ programming languages by the authors of this paper. Using the developed software systems, examples of the reliability analysis of the technical system components are presented.

Key words: reliability, reliability analysis, software system, technical system.

POSTER PRESENTATIONS

STRUCTURE, TOPOLOGY, PHOTOCATALYSIS AND PHOTOLUMINESCENCE OF 1D AND 2D SILVER-BASED COORDINATION POLYMERS

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Abstract: Four silver-based coordination polymers (CPs), $\{[Ag(L)_2](BF_4)\}_\infty$ (**1**), $\{[Ag(H_2BTC)(L)]\cdot(H_3BTC)\}$ (**2**), $\{[Ag_2(H_2BTEC)(L)_2]\cdot 3.33H_2O\}_\infty$ (**3**), and $[Ag(H_25SSA)(L)]_\infty$ (**4**), were synthesized using thiomorpholine-4 carbonitrile (L) as the primary ligand and three aromatic polyoxoacids as coligands: trimesic (H_3BTC), pyromellitic (H_4BTEC), and 5-sulfosalicylic acid (H_35SSA). L was chosen as a ligand since it belongs to the class of bismonodentate ligands which are able to form Ag-CPs. On the other hand, selected coligands showed photoluminescent properties. Beside the IR, NMR, TGA-DSC analysis, all compounds were crystallograficaly and topologicaly investigated.

The XRPD investigation indicates that the samples 1–4 correspond to the single-phase X-ray powder patterns in accordance with the structural model obtained by SCXRD. All compounds show reasonable photocatalytic activity for photocatalytic degradation of mordant blue 9 dye, with reaction rates in the 0.036−0.056 min^{-1} range.

Changes in the reaction rates can be correlated with the type and coordination modes of the coligands. Complex **3** exhibits photoluminescence at 77 K, while **4** exhibits photoluminescence at both room temperature and 77 K.

Key words: crystal structure, topology, photocatalysis, photoluminescence.

REMOVAL OF HEXAVALENT CHROMIUM CR (VI) FROM AQUEOUS SOLUTION BY ADSORPTION ONTO KAOLINITE

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Abstract: This paper studies adsorption of hexavalent chromium, Cr(VI), from aqueous solution onto natural clay kaolinite (kaolinite mine "Motajica", Kobaš, Srbac). The effect of adsorbent weight, contact time, pH value of solution and temperature on efficiency of adsorption was examined. Optimal parameters were: adsorbent weight m=0,5 g; contact time t=1 hour; pH=3,0 and temperature t=35ºC, while the efficiency, based on these parameters, was 31,12%. Adsorption of hexavalent chromium, Cr(VI), from aqueous solution onto natural clay kaolinite is the result of electrostatic interactions. Experimental data were analyzed using three linearized adsorption models: Freundlich, Langmuir and Temkin. In this adsorption process of hexavalent chromium, Cr(VI), onto kaolinite, the Freundlich isotherm model has the highest value of correlation coefficient (R2=0,961) and therefore best describes equilibrium phenomena of Cr(VI) adsorption onto this adsorbent. Based on the value of Freundlich constant, KF (=0,0416 (mgg-1)(mgL-1)1/n), which is in the correlation with adsorbent capacity, it is concluded that kaolinite has relatively low adsorption capacity for hexavalent chromium, Cr(VI). The second Freundlich constant, n, is related to adsorption intensity of adsorbent and surface heterogeneity. Obtained value for n, is greater than one (n=1,2516) and indicates that it is favored adsorption. Based on obtained and analyzed data of adsorption process, it can be concluded that natural clay kaolinite showed sufficient removal efficiency to be used as an adsorbent for hexavalent chromium, Cr-(VI), removal from aqueous solutions.

Key words: adsorption, kaolinite, hexavalent chromium, Cr(VI), Freundlich isotherm, Langmuir isotherm, Temkin isotherm.

REVIEW OF THE DEVELOPMENT OF MICRO-DRILLS FOR DRILLING SMALL HOLES IN MODERN COMPOSITE MATERIALS

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Abstract: Micro-drilling (MD or μD) is type of machining (processing) technology used for the drilling of miniaturized parts of small diameter in micro-scale, ie. diameter in a range of a few microns to several hundred microns. In paper is given the review of the development of micro-drills for drilling small holes in modern composite and nano-materials. An overview of the calculation and mathematical modeling of function of cutting forces, tool wear and torque depending on the cutting regime and geometric parameters of the micro-drill when drilling small holes in different composite and nano-materials is analyzed.

Key words: machining, micro-drilling (MD or μD), composite materials.

FROM RECYCLED POLYPROPYLENE TO ENGINEERING PLASTIC COMPOSITE VIA ADDITION OF WASTE PAPER

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Abstract: In this paper, the upcycling of recycled polypropylene with the addition of waste paper, appropriate compatibiliser, lubricant and antioxidant is presented. In the research work, compounding was performed on the twin-screw extruder. The addition of waste paper varied from 5 wt.% to 30 wt.% in the 5 wt.% steps. To improve the compatibility between the paper and rPP, the graft copolymer PP-g-MA was added in a concentration of 4 wt.%. The research proved, that good homogenisation was achieved with addition of lubricant, and the oxidation was prevented with addition of antioxidant. For the characterisation purposes, the test speciments were prepared by injection moulding, according to ISO 527 (form 1BA), ISO 178 and ISO 179.

The results of tensile and bending tests proved that E modulus increased significantly with addition of 30 wt.% waste paper. Tensile and bending strength increased up to 41 %, as well. The results of DMA tests showed the same tendency.

With the research it was proved, that with addition of more than 20 wt.% of waste paper, strength and storage moduli increased, while the impact strength practically remained unchanged.

The research results proved, that composite is industrial applicable since high compatibility was achieved.

Key words: recycled polypropylene, waste paper, composites, mechanical properties, thermal properties.

BIO-CERAMICS POROSITY AND FRACTAL NATURE

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Abstract: Hydroxyapatite scaffold as a bio-ceramic has cellular design as similarities within the morphologies design by nature. There is a need to control the structure of what is interesting for applications. By freeze casting, we can form the shape of dendrites and a foam structure after ice sublimation. After this process ice nucleation develops as more heterogeneous during freeze casting. We researched the mechanical properties of Hydroxyapatite.

We also analyzed the porosity by fractal nature characterization, and reconstructed pore shape, which is important for designing ceramic structures. We analyzed SEM images of samples with different five magnifications for the same pore structure, which is important for pores fractal reconstruction.

We completed the porosity fractal characterization and demonstrated successful shapes reconstruction. By this research report, we conformed original fractals application within bio-ceramics.

Key words: bio-ceramics, cellular design, frees casting, porosity, fractals.

APPLICATION OF CHROMATOGRAPHIC PARAMETERS IN THE ASSESSMENT OF AMIDE DERIVATIVES' BIOLOGICAL POTENTIAL

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Abstract: In silico approach is increasingly used in modern design to establish the qualitative/ quantitative dependence between structure, physico-chemical properties and biological activity of the new molecule. The selection and application of appropriate molecular descriptors are important step in this process. Given the presence of the amide group in numerous pharmacologically and biologically active molecules, in the pharmaceutical and chemical industries its formation represents an eternal challenge and a significant transformation in the design of the synthetic plan. Evaluation of the biological potential of selected amide derivatives included theoretical and experimental determination of their lipophilicity, analysis of their bioavailability, study of their pharmacokinetic predictors and ecotoxicity parameters. The parameters (RM0, m and C0) obtained by applying reversed-phase thin layer chromatography (RP TLC18 F254s) in the presence of two organic modifiers, as assumed measures of lipophilicity of the examined amide derivatives were correlated with the studied parameters of biological activity by the linear regression method. The quality of the obtained mathematical models was confirmed by the values of statistical validation parameters.

Key words: amide derivatives, lipophilicity, bioavailability, biological activity parameters.

LOCAL PIEZOELECTRIC AND MAGNETIC PROPERTIES OF (BI0.88GD0.12)FEO3 CERAMICS

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Abstract: For more than two decades, bismuth ferrite (BFO) has been a central material for fundamental multiferroics research, primarly because its intrin-

sic room-temperature multiferroicity, characterized by a spontaneous ferroelectric polarization along the [111]pc with a Curie temperature of 825°C and G-type antiferromagnetic order with a Néel temperature of 370°C [1, 2]. While the ferroelectric polarization of bismuth ferrite is promising the antiferromagnetic response is problematic due to its effectively zero remanent magnetization and low magnetic susceptibility. According to the literature it has been shown that breaking this antiferromagnetic ordering has been achieved by substitution of the A-site of perovskite lattice with a rare eart element – gadolinium [3]. In this work local piezoelectric and magnetic properties of gadolinium modified bismuth ferrite (Bi0.88Gd0.12)FeO3 ceramics were investigated. Local measurements were performed using atomic force microscope (AFM) equipped with a piezo-response force microscopy (PFM) and magnetic force microscopy (MFM) modes.

PFM and MFM images show that the matrix possesses uncorrelated ferroelectric/ferroelastic and ferromagnetic domain structures, which indicates the multiferroic nature of (Bi0.88Gd0.12)FeO3. Furthermore, Fe-rich secondary phases are not piezoelectric, but are ferromagnetic, as indicated by their weak magnetic domain structure (Figure 1). To conclude, in this contribution the local piezoelectric and magnetic properties in correlation with microscopic properties of (Bi0.88Gd0.12)FeO3 ceramics will be discussed. References: [1] G. Catalan and J. F. Scott, “Physics and applications of bismuth ferrite,” Advanced Materials, vol. 21, no. 24. pp. 2463–2485, 2009. [2] J. M. Moreau, C. Michel, R. Gerson and W. J. James, “Ferroelectric BiFeO3 X-ray and neutron diffraction study,” J. Phys. Chem. Solids, vol. 32, no. 6, pp. 1315–1320, 1971. [3] V. A. Khomchenko et al., “Effect of Gd substitution on the crystal structure and multiferroic properties of BiFeO3,” Acta Mater., vol. 57, no. 17, pp. 51375145, 2009.

Key words: bismuth ferrite ceramics, gadolinium-modified bismuth ferrite ceramics, multiferroicity, atomic force microscopy, piezo-response force microscopy, magnetic force microscopy.

OBSERVATION OF FE3O4→A-FE2O3 PHASE TRANSFORMATION AT LOW TEMPERATURE

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Abstract: Magnetic behavior of the magnetite nanoparticles synthesized by hydrothermal method was investigated in detail by SQUID measurements, established by Nikolić et al [1]. To get better insight in behavior of the prepared sample subjected to the thermal treatment, a more detailed thermo-gravimetric analysis was performed (thermal analyzer TA-SDT 2090). TG and DTA curves were mea-

sured by standard protocol. Additional measurements of the sample dried under the lowered pressure were also performed. Results revealed that processes observed as a consequence of a thermal treatment has strong exothermic nature; the most intense DTA maximum is observed at T = 289 °C. Having on mind results of XRD and TEM analysis [1], as well that magnetite to hematite phase transformation presents exothermic process: Fe3O4+1/4 O2= 3/2 α-Fe2O3+ΔH, ΔH=115 kJ 〖mol-〗^(-1) [2,3], observed exothermic process is ascribed to Fe3O4→α-Fe2 O3 phase transformation at low temperatures (<300 °C). Conversion of F
such low temperature is observed for the first time, and still presents open question. The author is gratefully acknowledged Dr N. Cvjetićanin for thermogravimetric measurements.

Key words: magnetite, hematite, thermo-gravimetric analysis, phase transformation.

LASER TECHNIQUES AND COUPLINGS WITH OTHER TECHNIQUES IN CONTEMPORARY PROBLEM SOLVING IN THEORY AND PRACTICE

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Abstract: Problems of today, *pro et contra* of new breakthroughs in high frequencies and pandemics, seem to have called for even more complex correlations and couplings of the fields: science, empiria (practice), mass-media in mastering the best possible description of certain processes in joint efforts to get out of a situation where our Globe had come to. More than ever, a lot of multidisciplinary work is needed, but also narrowly specialized sophisticated knowledge of the fields in which research is conducted.

In broad and generalized approach of coherent radiation interaction with material, the boundary of more classical scattering / interaction approaches seems

to be lost, because the notion of stimulated processes and short-term pulses opened close areas in interaction with material (in a broad sense including bio-phenomena) and smeared the moment when living cells began to participate in optical recordings, and it is known that statistics from biological processes may solve traffic problems, etc.

In this paper, the interaction of materials with stimulated electromagnetic radiation, its results and the most accurate description of possible processes will be considered. By emphasising the optically visible, infrared and ultraviolet areas, some implementations of the rest of the electromagnetic spectrum and modulation of materials or their measurement possibilities will be sketched.

For selected examples of materials of various classes, their possible description of characteristics before and after interaction from the point of view of laser, thermal immaging, and other techniques will be considered, where records of induced acoustic or series of other coupled effects –like magneto-optical, electro-optical, etc. come to the fore. Selected theoretically more complex models with computer support will also be considered, as well as simple final formulas, which lead to relatively useful estimates in the outcome of the interaction during monitoring a particular output channel.

In the spectroscopic approach, parts of spectroscopies that have laser or stimulated sources included and in that way new or only improved spectroscopies opened, will be discussed.

In this regard, interpretations become very sensitive areas. The approach of the application of laser and non-laser techniques to materials in general, (e.g. to biomaterials, or to heritage objects) and defining the samples and measurements on selected objects or materials, as well as practice, theory, reality in the fields of cultural heritage, medicine or specific areas which include damages, useful destructive processes or explosive processes in the use of laser techniques again raises the issue of laser damages and their definitions.

Entering into the field of protection by the induction of laser breakdown or by the initiation of various processes, must have detailed knowledge of the main optical indicators / descriptors of the material, including the concepts of reflection coefficients, scattering, absorption, thermodynamic parameters, ignition point, particle size if the material is in the powder state and similar.

Key words: laser techniques, interaction, scattering, materials, description, visualization.

MODELLING OF PHASE EQUILIBRIA IN AlCu5Mg1 ALLOYS

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Abstract: Al-based alloys were one of the first material types to which thermodynamic phase diagram calculations were applied. Since then improvements in modelling and the increase in computing power has enabled very accurate predictions to be made for phase equilibria in real multicomponent alloys. By JMatPro's property models a complete set of physical and mechanical properties can be calculated. The present paper describes a general methodology to calculate properties such as the fraction solid transformed, enthalpy, specific heat (C_p) etc. for multicomponent alloys.

Key words: ternary phase diagram, JMatPro, aluminium-copper-magnesium alloys.

APPLICATION OF SYNTHETIC ESTERS IN FORMULATIONS OF INDUSTRIAL LUBRICANTS

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Abstract: Synthetic esters represent a very important class of base fluids for lubricants with a wide range of physicochemical characteristics, which depend on the starting carboxylic acids and alcohols. The polar character of synthetic esters in relation to other base oils, gives them a great ability to dissolve additives of polar structure. However, too high a solubility can reduce the adsorption of functional additives in the area of the contact surfaces and worsen the tribological characteristics. Therefore, the formulations of modern lubricants combine the advantages of these base fluids in order to achieve a stable formulation and good tribological characteristics. Good rheological characteristics of certain synthetic esters in lubricant formulations contribute to lower participation of polymer additives. Biodegradability and higher thermal and oxidative stability, enable their use in various biodegradable hydraulic fluids and lubricating greases. The fire resistance of individual polyol esters is the most important characteristic for the formulation of fire-resistant hydraulic fluids. The new generation of polyol esters in the formulations of water-soluble metalworking agents improves the lubricating properties, and the lower volatility reduces the appearance of aerosols in the working environment.

The paper describes the results of testing the formulations of industrial lubricants based on synthetic esters.

Key words: synthetic esters, industrial lubricants, polarity, tribology.

ULTRASOUND ASSISTED ELECTRODEPOSITION OF Zn-Mn-Al_2O_3 NANOCOMPOSITE COATINGS

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Abstract: The nanocomposite coatings are novel type of materials which are composed of two or more components and at least one must be at nano scale. The nanocomposite coatings possess better properties compared to their micro versions and because of that this material found application in different industrial areas. The Zn-Mn coatings are already known as material with good corrosion properties. The aim of this work is to reinforce Zn-Mn alloy with Al_2O_3 nanoparticles to advance it corrosion properties.

The main problem in deposition of composite coatings is low dispersion stability of plating solution and agglomeration of the particles in plating solution. Consequently it is hard to achieve the homogeneous distribution of the particles in the matrix which is connected to good properties of the final product. In literature there are different methods for de-agglomeration of the second phase in plating solution, like ball milling, mechanical or magnetic stirring etc. The ultrasound applied during the deposition is beneficial not only for deagglomeration phenomenon but also for advancing the properties of the coating. In this work the ultrasound assisted electrodeposition of Zn-Mn-Al_2O_3 nanocomposite coatings is performed galvanostatically by 1; 2 and 4 A dm-2 current densities. Electrodeposition is preformed from four different plating baths, R1 was without Mn2+ ions, and R2, R3, R4 was with different Zn2+: Mn2+ ions ratio. The deposition time was 15 minutes. Composition of the coatings was analyzed by electron dispersive spectroscopy and corrosion properties were analyzed by different electrochemical methods. Namely, the Tafel polarization method and electrochemical impedance spectroscopy were used for determination of corrosion stability of the obtained composite coating in 3.5wt% sodium chloride.

The results show that Zn-Mn-Al_2O_3 composite coating had advanced corrosion stability in saline environment compared to Zn-Al_2O_3 coatings. The coating

deposited with 4 Adm-2 from bath 2 (Zn2+:Mn2+ ratio 1:1) showed the lowest corrosion current density and the lowest corrosion rate in 3 % NaCl solution.

Key words: ultrasound, electrodeposition, nanocomposite, nanoparticles, corrosion.

THE INFLUENCE OF THE ANODIC OXIDATION ON CORROSION STABILITY OF NB COATINGS PRODUCED BY PHYSICAL VAPOUR DEPOSITION

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Abstract: Development of the alternative processes for the „dirty" technology in all industrial areas is an essential task nowadays. Among the technologies that are most hazardous for environment and which has to be replaced by "green" processes are galvanic and decorative coatings. It is well-known that electroplating of finishes, like hard chromium, cadmium or nickel in metal finishing is recognized as a source of pollution which is very dangerous for environment and humans. Good alternative for the deposition of the coatings from standard plating baths could be physical vapour deposition (PVD), plasma-assisted chemical vapour deposition, and chemical vapour deposition (CVD) or thermal spraying. In this work the Nb coatings will be deposited on steel by PVD process. After deposition, the anodic oxidation on different potentials will be applied to obtain different colouring of the coating which is very important decorative factor today in many manufacturing areas. Two different solutions for anodic oxidation will be used and compared with commercial solution for this purpose.

The colour and morphology of the obtained coatings was examined by bench-top spectrophotometer and optical microscopy. The corrosion stability of the obtained coatings was determined in 3,5wt% NaCl by electrochemical techniques. Namely, the potentiodynamic polarization and electrochemical impedance spectroscopy was used to study the corrosion processes of the coatings in saline environment. Obtained results shows that coatings anodised at 140 V had the best corrosion performance from all solutions. Coatings anodised in prepared solution 3 showed advanced properties than those obtained from commercial solution. The corrosion rate was 0.018μm/year in 3 wt% NaCl.

Key words: physical vapour deposition, niobium, corrosion, anodic oxidation.

THE RISKS OF NANOTECHNOLOGIES UTILIZATION IN PROCESS OF WATER USE

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Abstract: Nanoparticles are the tiny materials with size ranged from 1 nm to 100 nm. Classification of nanoparticles could be done in different classes depending on their properties, shapes or sizes. Certain difficulties in classification of nanoparticles arise because the shape, size and structure of nanoparticles determine their properties.

These mutual dependencies cause the careful approach in classification of nanoparticles and direct to the more suitable classification based on their application. Utilization of nanoparticles could be applied in reaching commercial and/or domestic goals including medical applications, energy-based research, environmental and applications connected with sustainable development. Nanoparticles as complex molecules also are not of simple structure. They are composed of three layers: surface layer, shell layer and of the core. The complexity of nanoparticles inevitably leads to the question of their influence on environment and possible toxicity i.e. the risks of their utilization. Risks of the nanoparticles utilization in environment should be assessed after truly understanding their mobility, reactivity, eco toxicity and persistency. Especially the exposure of water, ground water and soil exposed to the nanoparticles' possible negative influences should be researched carefully. In this paper the effort for assessment of nanoparticles contribution and possible risks was done.

The model for risk of nanotechnologies utilization in water use is developed and assessed. The model for risk assessment was developed on the base of probability of undesired influences of nanoparticles utilized in process of water use.

The process of water use for human needs satisfaction includes the water supply, water consumption and water treatment. The risk of nanotechnology utilization includes the all segments of the process.

Key words: water, nanoparticles, environment, risks, eco toxicity.

DEVELOPMENT AND APPLICATION OF COMPOSITE WATERPROOFING MATERIALS

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Abstract:Abstract: In addition to traditional inorganic or organic waterproofing materials, in recent years there is significant development and application of modern composite waterproof materials, which meet the advantages of both, inorganic and organic compounds. Waterproofing materials have a wide range of applications in the protection of foundations and underground parts of buildings, bathrooms, balconies, pools, tunnels, water reservoirs, etc. The application of composite waterfroofing materials with improved functional properties prevents penetration of water in the interior of construction facilities, or water leakage from pools and the reservoirs. The technology of preparatory and final works and the installation of low-quality waterproofing material would cause great damage to the facility itself and additional repair costs. This paper reports the results of testing the most important functional characteristics of waterproofing compounds, of different chemical composition, in order to determine their performance. Dispersion waterproofing compounds, cement-based waterproofing compounds and polymer-cement compounds, as well as polyurethane-based and epoxy-based waterproofing compounds were tested. All samples were assigned basic physical-chemical and mechanical properties which are extremely important for this type of material. The test results show that modern composite waterproofing materials have excellent water repellency, high flexibility and resistance to mechanical impacts.

Key words: composite materials, waterproofing, water repellency, polymer masses, cement.

EFFECT OF pH CONDITIONS ON GOETHITE BEHAVIOR IN THE PRESENCE/ABSENCE OF DIFFERENT DISPERSANTS

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Abstract: Dispersion and settling behavior of goethite has been studied and effect of pH values on surface properties of goethite particles with /without dispersants has been discussed.

A prerequisite for the successful flocculation is the stabilization of the system which is achieved by the good dispersion of particles. The effect of pH,

sodium silicate (Na_2SiO_3), sodium hexametaphosphate ($Na_6P_6O_{18}$) and sodium pyrophosphate ($Na_4P_2O_7$), on the surface charges of goethite was studied .The IEP of natural goethite was found by measuring zeta potentialat pH value of 6.6. With the use of sodium silicate the IEP of goethite moves to pH 4.95. An IEP could not be detected when the poly-phosphates were used and the surface charge is negative from pH 2 to pH 12.

The relatively high zeta potential values indicate a fairly stable dispersion,especiallywhen the sodium hexametaphosphatewere used as dispersant.

Key words: goethite, dispersion, pH value, zeta potential, IEP.

APPLICATION OF SOLAR SIMULATORS IN PV TECHNOLOGIES

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Abstract: Solar cells and solar modules made of monocrystalline, polycrystalline and amorphous silicon on glass or plastic basis, GaAs, CdTe, CIS, organic, solar cells with concentrators, etc. are used in the world today to convert solar radiation into electricity.

For the physical characterization of solar cells and solar modules, solar simulators with xenon, halogen and LED lamps are used as light sources. Determination of energy efficiency of solar cells and solar modules using solar simulators is performed under the following standard conditions: temperature of 25 ^oC, solar spectrum AM1.5 and solar radiation intensity of 1000 W /m ^{2}.

The paper will provide an overview of solar radiation simulators used today in the world to determine the energy efficiency of solar cells and solar modules obtained using various photovoltaic technologies, as well as the characteristics of the solar radiation simulators themselves.

Key words: solar cells, solar modules, solar radiation simulators, energy efficiency.

EXCELLENT ANTIMICROBIAL ACTIVITY OF NOVEL NANOCOMPOSITES (PYROPHYLLITE CLAY BASED) MODIFIED WITH SILVER

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Abstract: Novel antimicrobial substances are among the most exploring in scientific circles nowadays. Nanocomposites proved to be one of the promising candidates. Novel research based on nanocomposites goes in the direction of synthesizing hybrid materials based on inorganic matrix of layered structure. Clays possess such specific layered structures and their structure can be modified. In this research pyrophyllite clay was in focus and was modified with silver, well known antimicrobial metal.

The main emphasis in this study was on antimicrobial efficiency of nanocomposite (pyrophyllite clay based) against planktonic (individual) isolates and against biofilm (community bacterial forms of living). Antibacterial activity against planktonic isolates of E. coli ATCC 8739 and S. aureus ATCC 25923 was detected with bujon microdilution method. Microtiter plates were inoculated with 100 µl of bacterial inoculum and treated with 20 and 40 mg of pyrophyllite clay/Ag material during overnight incubation with shaking at 37 °C.

Antibiofilm testing with 10 mg of nanocomposite was performed in microtiter plate against biofilm producing clinical isolates of Acinetobacter baumannii and Pseudomonas aeruginosa. In conclusion, nanocomposites of pyrophyllite clay/-Ag have excellent in vitro activity against all living forms of bacteria which could have enormous potential for wide practical usage of these substances.

Authors are thankful to the Ministry for Scientific and Technological Development, Higher Education and Information Society of Republic of Srpska for supporting the study through the project No. 19.032/961-78/19.

Key words: nanocomposite (clay based), antimicrobial activity, silver, biofilm.

DISPERSIVE EFFECTS IN SELF-INDUCED TRANSPARENCY SOLITON PROPAGATION

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Abstract: We study the effects of dispersion in carrier waves on the properties of self–induced transparency (SIT) in two-level media. The substantial impact of dispersion effects on typical SIT soliton features is predicted. For example, the degree of SIT pulse velocity slowing down (acceleration) is determined by the ratio of an incoming pulse frequency over atomic transition frequency – x = !=!0. Specifically, in the sharp–line limit an immediate pulse stopping is predicted for absorbing media when both frequency ratio and pulse duration time exceeds some critical values. In the amplifying media, superluminal motion is predicted as in the case of resonance.

However, there exists the lowest value in the frequency ratio below which the pulse velocity tends to the subluminal region.

In the inhomogeneously broadened media dispersion curve (K(x)), both for absorbing and amplifying media, exhibits gradual increase as function frequency ratio, approaching linear law for large x. On the other side, velocity delay vs normalized pulse width exhibits similar behavior as well as in the sharp–line limit. That is, in the absorbing media, near the resonance (x & 1), velocity slowly decays as pulse width increases. On the other hand, for x < 1, and for short pulses, superluminal motion is predicted.

This is an unphysical result and should be disregarded. In the amplifying media meaningful results, superluminal velocity, exist only in and above the resonance x = 1. An interesting behavior of the Ber's absorption coefficient is predicted: it, both in the absorbing and amplifying media, gradually decay as a function of frequency ratio, implying the enhanced transparency in the near resonance region.

New ways for the controlling of propagation of the electromagnetic waves in a two-level media can be developed by exploiting these new features of the SIT phenomena.

This may be achieved by varying frequency ratio. A possible way of practical realization is the design of devices based on quantum metamaterials with tunability in their parameters.

Key words: self-induced transparency, soliton, resonant propagation.

THERMAL CONDUCTIVITY OF GRAPHENE MONOLAYER IN THE FRAMEWORK OF DEBAYE AND CALLAWAY MODELS

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Absrtact: Thermal conductivity of graphene monolayer is analyzed, based on semiclassical Boltzmann transport equation in the approximation of relaxation time in the framework of Debye and Callaway models.

In both cases the phonon relaxation mechanisms on impurities, monolayer boundaries, and phonon-phonon interactions are considered. Electron-phonon and electron-electron interactions are neglected as they provide small contributions to thermal conductivity.

The three-phonon scattering N-processes in graphene monolayer thermal conductivity are accounted within Callaway model, while neglected within Debye model.

It is shown that Callaway model is more succesful than Debye model in explaining experimental measurements of thermal conductivity in graphene.

Key words: monolayer graphene, thermal conductivity, Debye model, Callaway model, relaxation times.

SYNTHESIS AND STRUCTURE OF IRON(III) COMPLEX WITH 2-ACETYLPYRIDINE-AMINOGUANIDINE

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Abstract: Schiff bases represent an interesting class of compounds due to a wide range of possible applications, especially their biological activity. Having in mind that the biological activity of the ligand could be closely related to its coordinating properties, we examined the synthesis and structure of a novel Fe(III) complex with the Schiff base of aminoguanidine and 2-acetylpyridine. Bis(ligand) complex of iron (III), of the formula [Fe(L–H)2]2(NCS)Cl, was obtained by the reaction of

FeCl3 and the thiocyanate ligand salt in a mole ratio 1:1 in the presence of lithium-acetate as a deprotonating agent.

The complex is obtained in the form of brown single crystals and is characterized by elemental analysis data, conductometric measurements, IR spectra, and X-ray analysis.

The latter revealed that the chelating ligand is coordinated in its monoanionic form via pyridine, azomethine, and nitrogen atoms of the aminoguanidine fragment, forming octahedral environment.

Key words: Schiff bases, guanylhydrazones, transition metal complexes, X-ray analysis.

DETERMINATION OF IONIZATION CONSTANTS OF SELECTED MONOCARBOHYDRAZONE DERIVATIVES

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Abstract: Carbohydrazone derivatives represent a very significant class of compounds due to their wide biological activity. Ionization states of functional groups present in the molecule are of vital importance for understanding of the pharmacokinetic and pharmacodynamic properties of the newly synthesized compounds.

One of the physicochemical parameters, the ionization constant (pKa), can be used as a molecular descriptor in order to relate structure and activity of a compound, which may indicate further potential application of newly synthesized derivatives.

In this work, ionization constants of twenty monocarbohydrazone derivatives were determined using potentiometric method, in order to obtain information about their ionization states under certain conditions.

Key words: biological activity, ionization constants, monocarbohydrazones, molecular descriptors, potentiometry.

IN-VITRO SOLUBILITY OF DIFFERENT EXPERIMENTAL CALCIUM-ALUMINATE CEMENTS AND MTA

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Abstract: The aim of this study was to comparedifferences in the solubility of the following materials:MTA, calcium-aluminate with the addition ofzirconium-dioxide (CAZrO2),calcium-aluminate with the addition ofstrontium-carbonate-(CaSrCO3) and calcium-aluminate with the addition of strontium-fluoride-(CASrF2).

Method: Ten samples of each material in the form of a cylinder wereimmersed in phosphate buffered solution (PBS). Their weight was measured before immersion, andafter thirty days of standing in the PBS solution,the samples were removed and was repeated to establish the difference in weight of each sample.

Results: The lowest solubility was shown with CASrF2(**One-Way ANOVA)*

which evenshowed increaseinthe initial mass by as much as (+14.05%) with high statistical significance($p<0.001$,*Paired Samples T-Test)***.**A lower value of increase in mass, was shown by CASrCO3(+2.24%).The highest values of solubility showed CAZrO2with loss of initial mass of -3.26%followed byMTA(-1.22%).

Conclusion: Taking into account the obtained results, CASrF2imposes as a good material for retrograde obturation of the root canal, which in some of its properties would surpass the materials used so far.Solubility of the material used for retrograde obturationin body fluids can be a major clinical problem given that they are a potential route for the passage of bacteria and their toxins, as well as the consequent reinfection of periapical tissue and treatment failure.

Key words: solubility**,** retrograde obturation of the root canal, dental cements.

A MODIFIED SUAREZ-SCHOPF MODEL OF ENSO PHENOMENON

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Abstract: ENSO is variation of the sea surface temperature (El Nino) and the air pressure (Southern Oscillation) at the equatorial Pacific. The environmental and socioeconomic impacts of this phenomenon are significant worldwide. In the simple nonlinear Suarez-Schopf model, a strong feedback in the coupled ocean-atmosphere system is included. In the modified Suarez-Schopf model we get: (1) increasing of instability with increasing of strength of the ocean-atmosphere interaction, (2) approximate description of El Nino events from 1980 till 2019, (3) different amounts of positive and negative temperature anomaly, in approximate agreement with measured amounts.

Key words: ENSO, ocean, atmosphere.

SOLAR RADIATION ATLAS IN BANJA LUKA IN THE REPUBLIC OF SRPSKA

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Abstract: The paper presents an atlas of solar radiation for the city of Banja Luka in the Republic of Srpska formed by PVGIS estimation utility.

The atlas contains the results of calculating global and direct solar radiation falling on the horizontal surface and global solar radiation falling on the optimally placed surface in Banja Luka in the period from 2007 to 2016. In addition, the intensity of global, direct and diffuse solar radiation falling on the optimally placed surface in Banja Luka is given by months. It was found that 13.89% less solar radiation falls on the horizontal surface and 47.31% less on the vertical surface as compared to the solar radiation that falls on the optimally placed surface.

The basic characteristics of fixed, one-axis and dual-axis tracking PV solar power plants power of 1 MWp and the amount of electricity that can be generated by them in Banja Luka, are also given. It was found that with the one-axis rotary solar power plant 30.18% more electricity can be generated, and with the dual-axis tracking

solar power plant 33.37% more electricity can be generated as compared to the fixed solar power plant.

Key words: PVGIS program, solar irradiance, solar energy, PV solar power plants.

THE ROLE AND SIGNIFICANCE OF QUANTUM THEORY IN THE LIGHT OF ITS LATEST ACHIEVMENTS

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Abstract: The paper analyzes scientific results obtained by quantum mechanics in recent years. This period is characterized by a significant expansion of the applicability of quantum theory and its direct transition to the area of practical applications. Significant achievements were conditioned by the development of the application-oriented research areas of quantum mechanics: decoherence theory, entanglement theory, quantum information theory. Since, at this moment the quantum-mechanical description is the most complete one of all the other known descriptions of physical reality, the conclusions made from its foundations are of fundamental importance and form the modern concept of the entire natural sciences.

Key words: Quantum mechanics, quantum correlations, nonlocality, decoherence, entangled states, quantum theory of information.

NONUNIVERSAL PROPERTIES OF SELF-INTERACTING POLYMER IN NON-HOMOGENEOUS ENVIRONMENT

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Abstract: We have studied lattice self-avoiding polygons with attractive interaction between contacts which are nonconsecutively visited nearest neighboring sites. The lattice of choice is 3-simplex fractal lattice and the model represents a ring polymer in non-homogeneous solution whose quality depends on the interaction parameter. It has already been shown, by the renormalization group

approach, that polymer on this lattice at any nonzero temperature can exist only in the extended phase. Universal critical exponents, which do not depend on the interaction strength, have also been determined. In this paper we are concerned with two nonuniversal quantities: the connectivity constant related with the free energy of the model and the mean number of contacts related with the internal energy.

We have shown that the connectivity constant is an unboundedly increasing function of the interaction strength, while the mean number of contacts is an increasing function asymptotically approaching a limiting value equal to one half, which is the mean number of contacts in the case of Hamiltonian walks on the same lattice.

This limiting value is expected, since in the limit of infinite interaction (or zero temperature) each self-avoiding walk on 3-simplex lattice becomes maximally compact and occupies all lattice points, i.e. becomes Hamiltonian walk.

Key words: polymer; self-avoiding polygon; fractal; nonuniversal quantities.

FORENSIC ANALYSIS OF COLORED MATERIALS IN THE FIELD OF LOW ENERGIES

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Abstract: Experimental color analysis in the field of low energies was performed by the method of infrared spectrophotometry with Furie transformation (FT-IR), on a laboratory instrument brand "Thermo Fisher Scientific" model "Nexus 6700". Examined samples of colored materials were collected during forensic examinations of traces of paint from various criminal events in the territory of the Republic of Serbia, in the period from 1999-2009. years. As it is already known that each color, at certain wave numbers, has characteristic spectrograms (especially in a specific, middle infrared region), in order to obtain a certain law in the behavior of color spectrograms, an experiment was performed. Concrete spectrograms were obtained by recording experimental color samples. It has been shown experimentally that colors in irreversible processes give exponential distributions with different parameters. During the recording, the interval of the wave vectors ranged from 450 to 4000 cm-1, so the exponential distributions were made with the exponent type. As the interval of the wave vectors lies in the deep infrared region, it is concluded that the color molecules exchanged low-energy quanta in collisions

with each other, which correspond to rotational energy levels or changes in the L-S interaction. The obtained results represent the most objective criterion for the identification of colored materials using experiments in the low-energy region, because the characteristic wavelengths are determined through the superposition of all individual exponential distributions.

Key words: Forensic analysis of colors, infrared spectrophotometry, distribution superposition.

PROCESS PARAMETERS INFLUENCE ON PURIFYING LUMINATE SOLUTIONS FROM IRON, ZINC AND COPPER IMPURITIES

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Abstract: The Bayer process represents the most significant and widespread process of aluminum production. The alumina produced by this process is most commonly used for the production of metallic aluminum, and can also be used as a catalyst, filler, abrasive and as a raw material for the production of many other compounds.

The most important and significant aluminum ore is bauxite. Bauxite is a mixture of compounds of which aluminum and iron are the most important. By digesting bauxite using sodium hydroxide, sodium aluminate is produced at high temperatures and pressures, in which besides aluminum and sodium there are various impurities.

The impurities adversely affect the stability of the aluminate solution and its properties, and later the quality of the product itself (alumina). These impurities, are bound to the crystal lattice of aluminum hydroxide, which results in a change in its properties as well as a decrease in its value. In order to avoid the harmful effects of impurities, certain processes must be used or their value reduced below the limit which is allowed.

One of these methods is to treat the aluminate solution with the seed crystal at a specific temperature, concentration of the seed and the time of treatment. The focus of this paper is to monitor the above parameters (t, c, tau) in order to remove the impurities of iron, zinc and copper in sodium aluminate.

Key words: Bayer process, sodium aluminate, crystallization germs, impurities.

CHEMICAL COMPOSITION OF INDUSTRIALLY PRODUCED OF JUNIPER BERRY ESSENTIAL OIL (Juniperus Communis L.) FROM THE REPUBLIC OF SRPSKA

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Abstract: The essential oil of juniper berries (Juniperus communis L.) is traditionally used for medicinal and flavoring purposes. The Republic of Srpska has a great potential of woody greenery and juniper berries as a possible raw material for the production of essential oils. Therefore, the subject of this study is to determine chemical composition of essential oil obtained from juniper berries (Juniperus communis L.).

The essential oil of the Juniperus berry was produced in industrial conditions by the hydrodestilation process, in cooperation with the PEF "Forest of Republika Srpska", a.d. Sokolac. A light yellow essential oil, a pleasant smell, yield of 1.3% was obtained. Qualitative and quantitative composition of the oil was determined by GC-MS and GC-FID analysis. The obtained results proved the presence of 58 components, wherein the highest content of α-pinene (29.3 %), myrcene (12.7 %), sabinene (9.5 %), germacrene D (8.4 %), limonene (3.6 %) and (E)-Caryophyllene (3.4 %) is determined.

Key words: Essential oil, Juniperus communis L, GC-MS analysis.

WOODEN STRUCTURES IN KENGO KUMA FACADES

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Abstract: Kengo Kuma, Japanese architect, realized a large number of urbarchitectonic structures worldwide, especially in the second decade of this century, emphasizing use of wooden materials in the facades.

The examples of buildings in this paper demonstrate an extraordinary lucidity and opting of the designer for continuous use of the natural, environment-friendly material whose texture of wooden elements provides effective esthetic-composition and artisanal-artistic, attractive archisculptural results.

The pronounced use of many times repeated timber elements created elegant latticework gigantic, harmonic façade network with new hand-made forms, without using bolts, nails or glue to join them. By using the easily available resource – wooden material, the famous architect's end goal is "effacing" of the already seen architecture, i.e. façade of the new non-standardized and non-stereotypical structures of organically, imaginatively well integrated into the natural environment.

Facades created by moving multiplied wooden elements, in a varied rhythm, along the vertical and horizontal lines, evoke a spatial narration, subtle visual sensations, whereby materiality and close rapport with the building tradition is of primary importance.

In the paper, the attention is focused on the advanced ecourbarchitecture of "building with wooden material" using the contemporary computer technologies, with new designing artistic and visual approach to the culture of walls in the exterior.

Key words: wooden elements, façade networks, natural materials, visual sensations, materiality.

AFFECT OF MEAT TYPE AND SMOKING TEMPERATURE ON THE CONTENT OF POLYCYCLIC AROMATIC HYDROCARBONS (PAH) IN MEAT PRODUCTS

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Abstract: Numerous processes take place in the meat during processing. They can have a positive or negative impact on the properties of raw materials and finished products.

The aim of this study was to determine the influence of meat type (sheep and chicken meat) and smoking temperature (hot or cold smoking) on the content of polycyclic aromatic hydrocarbons (PAHs) in meat products. Four experimental groups of samples for each of the examined types of raw materials analyzes in this paper.

The following parameters were varied: temperature (55-70^{o}C), smoking time (90-360 min) and relative humidity (74-86%).

The content of 13 PAHs in meat products was determined by mass chromatography with mass detector (GC/MS). The following PAHs were detected in finished sheep meat products: Acenaphthylene (Acy), Fluorene (Fln), Fenantren (Phe), Anthracene (Ant) and Pyrene (Pyr).

The presence of: Phenanthrene (Phe), Anthracene (Ant) and Pyrene (Pyr) was found in chicken meat products. The content of other determined PAHs was below the detection limit (<1,50 µg/kg). The results are presented as the content of total PAHs, the content of total high molecular weight polycyclic aromatic hydrocarbons (total HMW PAHs), the content of total low molecular weight polycyclic aromatic hydrocarbons(total LMW PAHs)the content of total non-toxic PAHs. The presence of genotoxic PAH8 was not detected in the analyzed products.

The statistical significance of processing temperature on the content of 5 PAHs in finished products regardless of the type of meat ($p < 0.05$) and the influence of the type of meat regardless of the temperature applied during meat smoking ($p < 0.05$) were determined.

Key words: meat products, smoking, PAHs.

PRINCIPLES AND APPLICATION OF NOVEL TECHNOLOGIES IN THE FOOD PRESERVATION

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Abstract: Heating during canning of food causes loss of sensory properties and nutritional quality of the product. Manufacturers want to apply processes that can simultaneously reduce the microbiological load and maintain the quality of food products. These processes are known as mild or alternative food processing processes.

This paper provides an overview of modern research related to the development and application of new canning technologies during industrial food processing.

In addition, the possibilities of their application in the future for commercial use in industrial conditions are analyzed.

Key words: food products, preservation, alternative methods, mild processes, minimal processing technologies.

ONE-STEP SYNTHESIS AND CHARACTERIZATION OF A NEW MAGNETIC POLYACRYLATE NANOCOMPOSITE WITH ANILINE

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Abstract: In this study, a novel magnetic poly(glycidyl methacrylate-co-trimethylolpropane trimethacrylate)-aniline nanocomposite was synthesized by suspension copolymerization. Firstly, adduct from glycidyl methacrylate and aniline (GMA-Ani) was synthesized and than copolymerized with trimethylolpropane trimethacrylate in the presence of magnetic nanoparticles. The magnetic nanocomposite was characterized using FTIR-ATR, FAAS, elemental analysis and optical microscopy.

Key words: magnetični nanocompozite, glicidyl methacrylate, aniline.

LED TECHNOLOGY FOR DRINKING WATER PURIFICATION

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Abstract: Modern conditions for the development of society are characterized by a simultaneous increase in requirements for the quality of life of people, on the one hand, and an increase in the number of opposing factors, on the other. In this case, the interaction of the components of the process is of a competitive nature, in which the improvement of some components occurs at the expense of the deterioration of others.

One of the most important leaving systems of life support of society are water supply systems. Their development is characterized by the tendency of annual improvement in the quality of drinking water, on the one hand, and an increase in the number of factors that negatively affect its composition, on the other.

This refers to the action of factors of physicochemical, bacteriological, mechanical and other origin. Moreover, their action in most cases is complex, often interrelated. However, studies carried out at the O.M. Beketov National University of Urban Economy in Kharkiv (O.M. Beketov NUUEK), under the guidance of Acad.

Hovorov P.P., testify to the increasing role of the bacteriological factor. At the same time, the events of recent years and, especially, the occurrence and nature of the course of the COVID-19 pandemic are a vivid confirmation of this. Moreover, the further course of the development of COVID-19 indicated the threat of its even wider spread, against the background of the imperfection of the existing drinking water supply systems and the urgent need to improve their structures and fundamental principles. Existing methods of water purification, as well as schemes for its disinfection, which are not able to meet the current requirements for the quality of drinking water and do not fully meet the requirements of energy efficiency due to the use of ineffective equipment and technologies. Bactericidal installations used in drinking water purification systems are based on the use of ultraviolet gas-discharge mercury-argon or mercury-quartz lamps. The presence of suspended solids in the water and the low light output of the lamps reduce the efficiency of the disinfection process. In addition, the design of the installations allows water purification only in places with very high bacterial contamination. In this regard, installations for water disinfection based on existing bactericidal lamps are ineffective and are located mainly at nodal pumping stations. These disadvantages can be summarized as follows: – high energy consumption of systems for bacteriological purification of drinking water; - concentration and local coverage of systems; – large weight and dimensions of installations; - operational problems associated with the inaccessibility of installations and the need for frequent replacement of radiation sources. The presence of the noted shortcomings of the existing drinking water supply systems hinder their response to the challenges of the time, including the problems associated with COVID-19. Therefore, the search for new and improvement of existing technologies for disinfection of drinking water is an important and urgent task.

The aim of the work is to find effective ways to reduce the effect of harmful organisms in water on humans by disinfecting it using light radiation of a certain intensity and spectrum of radiation. The task of the work is to study the effect of LED ultraviolet light sources on harmful organisms that are in water, and to determine the radiation spectrum that will have the greatest effect on them. Research conducted at the O.M. Beketov NUUEK, pointed out the possibility of solving these problems by using ultraviolet emitters based on LED light sources. Studies of the lighting characteristics of ultraviolet light-emitting diodes, carried out using the equipment of the O.M. Beketov NUUEK Lighting Measurement Center, indicated that their use is able to reduce the power consumption of the installation by an order of magnitude and their durability by two orders of magnitude. In addition, the use of LED emitters provides a 4-6 times reduction in the mass and dimensions of the installation, as well as the possibility of their installation at any point in the water supply network from the pumping station to the consumer (apartment, house, etc.). As a result, the possibility of bactericidal treatment of water is created at all elements of the water supply system, and most importantly, directly at its consu-

mers, thereby minimizing the uncontrolled impact on its bacteriological indicators at any level. Thus, conditions are provided for a more reliable and safe supply of drinking water to consumers, especially in conditions of a possible uncontrolled impact on its biological indicators. For certain conditions and purposes, the work proposed the structure of an energy-efficient bactericidal installation based on ultraviolet LED light sources, which provides a distributed multi-level disinfection of water in the drinking water supply system. Based on the study of the effect of various types of light sources on organisms harmful to humans contained in water, recommendations have been developed for the construction of technical means of bactericidal action. Based on the research results, a mathematical model of the process of radiation exposure to harmful organisms in water has been developed, the scope and conditions for the use of installations have been established.

The practical value of the obtained results lies in the possibility of practical application of LED ultraviolet light emitters for the purification of drinking water at any stages of water preparation and at various levels of water supply. To implement the considered approach, it is necessary to investigate the operation of LED light emitters in existing installations for bactericidal water purification and assess the fundamental possibility of widespread introduction of such technologies.

Key words: Water purification, LED technologies, bactericidal installations, bacter.

EVALUATION OF CEMENT MIXTURES IN THE DESIGN PHASE FROM THE ASPECT OF WATER USE

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Apstrakt: Globally, there is a declining trend in the amount of available fresh water, while the amount of it used is increasing, due to the growing needs of the population, agriculture and industry. Cement is one of the dominant building materials used in the construction industry worldwide. For the purposes of the research, a comparison of five cement mixtures was made. The research uses Life Cycle Analysis (LCA), a methodology that is the basis for the analysis of the impact during the life cycle of construction products. The software package BEES, National Institute for Standardization and Technology (NIST), United States of America is used for calculation. Five types of cement were analyzed, from the aspect of water consumption and impact on water resources, environment, and hu-

man health, as well as the economic aspect. The research has shown that in the design phase, the application of software packages can be used to manage the quality of the environment. The research also indicates the need for a national software package for the evaluation of construction products and materials. This would improve the design, the national construction industry and favor materials with favorable characteristics and less impact on water resources and the environment.

Key words: building materials, life cycle analysis cementitious materials, ecological impact, water footprint.

DIELECTRIC PROPERTIES OF THE LITHIUM-POLYMER BATTERY DURING CHARGE AND DISCHARGE

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Abstract: Dielectric spectroscopy has been widely used for the analysis of electrochemical processes in batteries that are influenced by many variables. The results of dielectrical spectroscopy measurements are modeled very successfully by using electrical equivalent circuits. In this work the frequency dependence of impedance, dielectric permittivity and dielectric loss of Lithium-Polymer battery is analysed in detail. Dielectric properties have been studied over a range of frequency from 24 Hz to 75 kHz. Differences in impedance spectras between fully charged and discharged battery as well as other states of charge is observed and discussed.

Key words: Dielectric spectroscopy, lithium-polymer battery, state of charge.

ANTIBACTERIAL AND DIELECTRIC PROPERTIES OF TEXTILE MATERIALS MODIFIED WITH HERBAL EXTRACT OF *Picea omorika* AND THE COPPER FERRITE NANOPARTICLES

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Abstract: In this paper, cotton, polyester and cotton/polyester fabrics were modified by using herbal extract of *Picea omorika* and copper ferrite nanoparticles

and their antibacterial and dielectric properties were investigated. Antibacterial activities of all samples were examined against *Escherichia coli* and *Staphylococcus aureus*. The mostof the fabrics modified by copper ferrite showed antibacterial activities against *Escherichia coli*, while theaddition of the herbal extract improved their antibacterial protection. Dielectric properties were measured in frequency range from 24 Hz to 75 kHz at room temperature and the results showed that the modification of all three fabrics with copper ferrite caused increase in their AC conductivity.

The obtained results point to the possibility of using investigated fabrics for antibacterial protection as well as for the electromagnetic shielding application.

Key words: Antibacterial properties, Dielectric properties, Fabrics, Herbal extract of *Picea omorika*, Copper ferrite nanoparticles.

PROBLEMS AND DEFINITION OF MEASUREMENTS IN TRIBOLOGICAL SYSTEMS

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Abstract: Tribology has the task not only to connect the knowledge about friction and wear resulting from the work of researchers and practitioners in different fields, but also to explain all activities aimed at improving friction and wear and reducing losses of tribological origin. Identification and measurement of tribological characteristics of materials, elements of the tribological system is reduced to the identification of the friction process in the contact zone and the wear process of each element separately.

The parts that make up the tribological system are the pin and the disk. The pins are made of ductile iron and the disks of steel and gray cast iron. Equipment for conducting experiments with a measuring chain of triboelements with special emphasis on (Talysurf 6) on which the shape and depth of the contact surface of the pin are measured.

This paper presents a small part of the research.

Key words: tribology, tribometrics, tribological characteristics, friction and wear.

DATA CORRELATION OF COMPRESSIVE STRENGTH OF SEMI STONE SEDIMENTARY ROCKS WITH DESTRUCTIVE AND NON DESTRUCTIVE TESTING METHODS

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Abstract: Determination of compressive strength of rocks is the simplest with the method of destruction on the classic press, but those tests are not always possible. Another way of testing is a non destructive, with the use of method of ultrasonic wave propagation. Combination of these two methods can be used to correlate the obtained data and obtain some real values of rock strength in a rock massif. In the paper are shown the results of destructive testing on the classic press, while other methods, although more numerous, were not include since the tests on the classic press were the most present. Testing was conducted on semi stone sedimentary rocks, from soft to solid, that are mostly present in civil engineering and that have a great number of reliable samples that can be used for testing.

Key words: compressive strength,testing on the classic press,ultrasonic testing, results correlation.

INFLUENCE OF COMPONENT MATERIALS TYPES ON SELF-COMPACTING CONCRETE COMPRESSIVE STRENGTH

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Abstract: The compressive strength of concrete, as well as the strength development, are one of the basic parameters used in the design of concrete structures, as well as determining the dynamics of the casting concrete. Given the wide range of benefits provided by the application of self-compacting concrete, it is very important to know the influential parameters on its properties. The paper presents own experimental research, carried out on 14 types of self-compacting concrete. The influence of different types of additives and aggregates of different origin on compressive strength of the concretes at ages 2, 7, 14 and 28 days were analyzed by statistical methods. The research showed that the compressive strength of self-

compacting concrete is dominated by the use of recycled aggregate and fly ash, in relation to natural aggregates (river, crushed and their combination), lime and other parameters. Strength increment functions with very strong to almost perfect correlations have been established.

Key words: self-compacting concrete, aggregate, additives, compressive strength, experimental research.

EFFECT OF MIXING APPROACH ON THE PROPERTIES OF CONCRETE WITH DIFFERENT AGGREGATE TYPES

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Abstract: The subject of the tests presented in the paper is the influence of the mixing method on the physical-mechanical properties of fine-grained concrete with the nominally largest aggregate grain of 8 mm. Concretes with three different aggregate compositions (river, crushed and mixture with coarse recycled aggregate) were mixed by the usual, and then by two-stage mixing approach (TSMA). Slump and flow, density and temperature were tested for fresh concrete. The compressive strength, flexural, splitting tensile strength, density, ultrasonic pulse velocity and water absorption were recorded on hardened concrete. Concretes prepared using recycled aggregate can, according to all the mentioned tests, be used as an adequate replacement for concretes prepared using river or crushed aggregate, while the two-phase approach had the greatest effect on increase of the flexural strength.

Key words: recycled aggregate, concrete, two-phase mixing approach, properties of concrete.

RADON MAPPING

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Abstract: Radionuclides in nature are found in air, water and soil as components of rocks, soil, sea and ocean. Natural radioactive gas radon has the largest

share in the total received dose of the population. Exposure of the population to high concentrations of radon causes malignant lung diseases. Therefore, many states have adopted legislation aimed at protecting against radon and have made significant efforts to identify areas with increased radon concentrations.

The first law concerning the protection of the population from radon appeared in 1941 in the United States. The health effects of radon were also recognized in Europe, where in 1950 the first guidelines and recommendations for protection against radon by the International Commission on Radiological Protection (ICRP) appeared. The problem of radon has not been approached in a systematic and organized manner in Bosnia and Herzegovina, as well as in the countries of the region. Currently, several research groups and institutions deal with thematic radon. It is a good basis to unite all these activities into national programs and to define strategic goals and action plans.

The basis of any national radon program is to obtain a radon risk map. A large number of international projects with this topic show how important it is. Currently, projects within the EU research area are underway with the aim of creating a large atlas of natural radioactivity in Europe with an emphasis on radon.

Key words: natural radioactivity, radon, regulations, radon maps.

MULTIVARIATE REGRESSION ANALYSIS OF INDOOR THORON DATA FROM NORTH MACEDONIA

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Abstract: The first systematic research of indoor toron concentrations in Republic of North Macedonia began in 2008/2009 when the National Survey was conducted in 300 dwellings. Furthermore, a few years later, in 2012, a smaller campaign was carried on, in which indoor thoron measurements were done in 30 schools. In both studies, the same methodology was used; it means that the indoor thoron concentrations were measured with Raduet detectors deployed in ground floor room at a distance of more than 50 cm from any wall surface with an exposure period of 3 months.

The main conclusions from both studies were that indoor thoron concentrations are subject to temporal and spatial variations. Considering this, we decided to developed models that could make predictions of annual thoron concentrations due to seasonal measurements performed in buildings built with different building materials from different parts of the country. Since the log-transformed values of the measured data were with normal distribution moreover the same data grouped by geotectonic units and type of building materials were with homogeneity of variance, so the criteria for multiple linear regression was satisfied.

For the models which presented thoron seasonal variations, the Pearson coefficient of determination (R^2) was in the range from 27% for summer measurements in buildings with basement up to 54% for spring measurements. The model for thoron spatial expressed through geotectonic units and building materials had a value of R^2=21%. Although statistically significant, indoor thoron seasonal and spatial models are in general with poorer performance compared to the same linear models for indoor radon in Northern Macedonia.

Key words: indoor, thoron, regression, analysis.

EXPERIENCE OF INNOVATIVE EDUCATION OF TALENTED YOUTH

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Abstract: The problem of integrating the growing talented generation into the global innovative environment of quality education in Ukraine requires their professional competence; the ability to acquire knowledge through independent learning outside the school; autonomy, which implies the ability to independently and independently resolve issues of an appropriate level of competence and responsibility; professional adaptability; maintaining the health of the specialist when introducing new technologies and equipment. Donbass State Engineering Academy was one of the first where the quality assurance system for education is implemented most fully - at all training courses at the same time, including distance learning. At the initiative of the authors, a "Continuing Education Program for the Region's Enterprises" was developed. To implement this program, four subprograms were developed and implemented: “School”; "Personnel for enterprises"; "Science of Production" and the "City" program. Branches of graduating departments are guided by the "Regulations on the branches of departments", plans for the further development of the Academy and major enterprises.

The main goal of the article is to present innovative measures to ensure the entry of youth into the global innovation space. The enterprises, together with the Academy, develop and offer new integrated schemes for organizing the educational

process with in-depth practical training in the specialty, including an individual agreement with interested companies and a dual form of training.

In view of the need for continuous, flexible, independent education, which is ensured by the introduction of the principles of open education, a project has been proposed to create the "International University of Continuing Education" as a system for the development of human intelligence and creative abilities throughout life. As a result of the evolution of the continuing education environment and the experience of the Donbass State Engineering Academy, the ways of further development of the system for integrating youth into the global innovation environment are proposed and justified.

To this end, in particular, commercialization of student startups, the creation of a system of engineering lyceums in the cities of Donetsk region, the creation of permanent exhibition centers on corporate bases to promote the technical and scientific development of students and youth, and the creation of creative engineering laboratories-studios with enterprises and extracurricular institutions are provided and smart platforms for testing business ideas.

Key words: target training, specialist adaptation, continuous education, technopark, innovation, engineering education.

CONCEPTUAL MODELING OF TRAINING OF SPECIALISTS IN A MODERN UNIVERSITY

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Abstract: The authors of the article present the features of creating poorly formalized models, reflecting the competence approach, which allows monitoring the formation of the necessary competencies of the future specialist in the light of changes in his personal values. Taking into account the individual characteristics of students, solving educational problems, taking into account the interests of students, diversity, novelty, emotional class, as well as general cultural level, erudition, scientific and methodological preparation, responsibility, hard work, conviction, reasonable demand, pedagogical ensure the quality of the educational process. For the success of the educational process, it is important to have an attitude towards the formation of competencies of future specialists, based on the internal needs, motives of students, as well as on the set of acquired knowledge, skills and professional skills.

The purpose of preparation and the set of psychological and pedagogical instructions allowed to form the content of specialist training, certain requirements for professionalism, as well as the value system of the specialist's coordinates. In the

process of forming a specialist, the most important are the educational activities and psychological and pedagogical support for personal development. It is these components of the personal subsystem of the model of the specialist training process that allow him to realize the aspects identified by us in the model of activity: lists of spheres, objects, types of professional activity, tasks and competences required. The central concept of modeling theory is the concept of adequacy. Purpose of the study: to establish the relationship between training and test sets when creating adequate models of objects of different nature. The neural network based approach is a mathematical construct with a variable structure that depends on the input. The adequacy of such models is verified on the basis of satisfactory testing on a test set which is not included in the training set, and the volume of the output data sets is directly related to the quality of the models formed on the basis of these data. The minimum of the total error estimated against randomly formed subsets occurs when establishing the test set as 1/3 of the randomly selected portion of the total data set used for the simulation. Such a recommendation is certainly different from the 80% / 20% recommendation and should be taken into account when building neural networks.

Training professionals as a system of pedagogical technologies influences the formation of motives for success. Therefore, it is of great importance to identify methods for managing the complex of personal qualities of students in the group of specialists through the construction and use of adequate neural network models.

Assessment of the degree of achievement of results in the formation of necessary competencies leads to the need for timely correction of educational technology. Only sufficient motivation, based on spiritual, social and physical education (culture education) and the needs of the student's personality (model of student's personality), can really form such professional qualities of a specialist, which will allow to ensure the adequacy of a trained specialist through his professional activity.

Key words: competence, personal values, pedagogical technologies, neural networks, modeling adequacy, system.

INFORMATION TECHNOLOGY AS A MECHANISM FOR MANAGING THE QUALITY OF EDUCATION

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Abstract: The article covers topical issues of effective implementation of the latest information technologies in the management of secondary schools. It was found that the mechanism of informatization of the educational environment is of special importance for ensuring high-quality educational activities, both managerial and

educational. Recommendations for the creation of a single information educational environment of the education management system have been developed. The article reveals the innovative mechanisms of education management in the information society, clarifies the prerequisites and factors of such management. The author substantiates the problems that arise in the management of education in the process of transition to the information society. It is determined that information technologies have a positive effect on all components of the education system. The current directions of quality management of education in the modern educational space from the standpoint of the New Ukrainian School and the definition of innovative ways to solve them are covered. Mechanisms for ensuring the quality of professional training of management personnel in the field of education using cloud technologies are revealed.

Key words: information technologies, education management system, information society, education quality management, cloud technologies.

EMPOWERING STUDENTS IN SCIENCE: PHYTOSYNTHESIS, CHARACTERIZATION AND BIOMEDICAL APPLICATION OF METALLIC (Ag, Si, Cu) AND OXIDE (ZnO, TiO2, CuO, Fe2O3) NANOPARTICLES: MICROBIOLOGY, BIOKINETICS AND TOXICOLOGY ASPECT

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Abstract: Four students of Chemistry Department, Faculty of Natural Sciences and Mathematics, University of Banja Luka were involved in national research project ”Phytosynthesis, characterization and biomedical application of metallic (Ag, Si, Cu) and oxide (ZnO, TiO2, CuO, Fe2O3) nanoparticles: microbiology, biokinetics and toxicology aspect” led by their professors. Students role was to independently synthesize metallic oxides: ZnO, TiO2, CuO, Fe2O3 using green chemistry approach and to evaluate metallic oxides physicochemical properties. All the metallic oxide sample were phytosynthesized using methanolic extract of flowers of Geranium robertianum L. (Geraniaceae).

For characterization students used UV/VIS spectrophotometry, infrared spectroscopy and optical microscope. Additionaly, students evaluated photocatalytic properties of obtained samples, as well as, antimicrobial activity. All the samples were in nanorange, ZnO (530 nm), TiO2 (460 nm), CuO (710 nm), Fe2O3

(980 nm), showed good antimicrobial properties against gramm negative (E.coli) and gramm positive (S. Aureus) bacteria with average MIC value 0.312 mg/mL for S. Aureus and 0.156 mg/mL for E. coli. Photocatalytical efficiency was between 77 - 96% depending on the metallic oxide.

The main focus of students involvement in research project was giving importance to scientific work and students' empowering in scientific research. Authors are thankful to the Ministry for Scientific and Technological Development, Higher Education and Information Society of Republic of Srpska for supporting the study through the project No. 19/6-020/961-74/18.

Key words: phytosynthesis, photocatalysis, antimicrobial activity, nanoparticles.

EFFECTS OF SURFACTANT STRUCTURE ON CONDUCTIVITY OF PB(II) COMPLEX WITH 18-CROWN-6 ETHER

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Abstract: Application of surfactants as carriers for metal cations and their influence on complexation between metal cations and cyclic polyethers has become the subject of many investigations. Surface active agents find wide applications in different analytical procedures due to their amphiphilic properties and the possibility of micellar aggregation. In this paper effects of surfactant structure (Triton X-100 and Triton X-45) on the conductivity of Pb(II) complex with 18-crown-6 ether has been investigated. The results showed that nonionic surfactants with oxygen atoms in the hydrophilic segment of their molecules showed electron-donor properties during interactions with metal ions. The influence of the surfactant structure confirms, that the length of the polyether chain affects the metal-surfactant interactions. Triton X-100 with a higher number of oxygen atoms in the surfactant structure (longer oxyethylene chain), compared to Triton X-45, affected the higher absolute values of the conductivity of systems, but not the change in the stoichiometric ratio between a metal ion and macrocyclic ligand.

The results also showed that the addition of a nonionic surfactants lead to a better-defined stoichiometry of the Pb(II) complex in dichloromethane, significantly contributed to its stability and the absolute conductivity values increased.

The effect of surfactant on the complexation of Pb(II) ions in the aqueous medium is opposite and lower conductivity values were measured.

Key words: conductometry, surfactant structure, 18-crown-6, Pb(II), conductometry, surfactant structure, 18-crown-6, Pb(II).

EFFECT OF METHYL METHACRYLATE ON THE PROPERTIES OF SYNTHESIZED ACRYLATE EMULSIONS

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Abstract: The paper investigates the effects of adding methyl methacrylate (MMA) on the properties of synthesized acrylate emulsions. The samples were synthesized in batches with the addition of MMA ranging from 10 to 50 % of the total mass of butyl acrylate (BA) and 2-ethylhexyl acrylate (EHA). Fourier transformation infrared (FTIR) spectroscopy was used to analyze the molecular structure of synthesized acrylate emulsions and the results confirmed that a quantitative polymerization reaction occurred.

The analysis of thermal properties showed that the addition of methyl methacrylate increases the glass transition temperature of the films obtained by drying the synthesized emulsions.

The tensile strength and elongation at break increased proportionally with the increase of the content of MMA in the synthesized emulsion samples. Since the obtained acrylate materials can be used to improve the water impermeability of paper and other materials, the experiment involved applying the emulsions (in a thin layer) on a sheet of paper and investigating the resistance of the paper to water and oil.

The results showed that all emulsions were impermeable both to water and oil.

Key words: emulsion polymerization, acrylic coatings, synthesis, methyl methacrylate.

HYDROGEN IN METALS

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Abstract: Hydrogen in metals attracts interest from scientists since many decades. Most of the interesting properties are related to the small size of hydrogen: its interstitial diffusion accompanied by quantum mechanical tunnel transport

results in an extraordinary high mobility of hydrogen atoms in materials. The objective of this chapter is to analyse interaction between hydrogen and metals. Different techniques that are able to give important information about lattice deffects that trap hydrogen were discussed.

Most attention was given to the hydrogen desorption kinetics. Metal-hydrogen systems are very interesting because of their application in construction of energy storage devices.

Key words: Hydrogen, hydrogen and metals, hydrogen kinetics, energy storage.

FUNCTIONAL PRINTING MATERIALS FOR SMART TEXTILE APPLICATIONS

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Abstract: Smart textile has the ability to recognize and respond to stimuli from the environment, such as electric and magnetic field, mechanical load, temperature, irradiation or chemical vapors. With the development of the textile industry, as well as technology in general, there is an increasing use of printing in the production of contemporary textile materials, which at the same time retain their positve traditional properties, and also have additional functionalities. There are several technologies that can be used for printing of functional materials on textile substrates, but the most commonly used are sheet-based InkJet and screen printing. The functional materials that are primarily used in this field are conductive inks, such as metal nanoparticles inks, organometallic inks, conductive polymers, as well as inks with graphene and carbon nanotubes. This paper reviews the potentials and challenges in printing of functional materials on textiles. The challenges exist in the complex interaction between the liquid ink and porous substrate, and the development in the field of smart textile printing largely depends on the development in the field of functional inks.

Key words: Functional printing, conductive inks, smart textile.

INDOOR RADON CONCENTRATION CORRELATED WITH THE GEOLOGICAL PARAMETERS OF THE TREBINJE CITY, REPUBLIC OF SRPSKA

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Abstract: The paper deals with the analysis of the indoor radon concentration results measured in four schools of Trebinje city and taking into consideration their geological background and its characteristics.

There havebeen 13 measurements and the results showed the range of 75 Bq/m3 to 4244 Bq/m3. Some of the indoor radon concentrations were very high, up to 15 times higher than recommended ones reaching the level of300 Bq/m3. In each of the four schools there are spots with the high geogenic potential and, 38 % results show a concentration higher than 1100 Bq/m3, which further characterize this area as Radon Priority Area.

From the geological point of view, the geological list Trebinje represents a part of Mesozoicand Paleogenic complex which build the outdoor Dinaride part.

There are also different varietiesof calcium carbonate and dolomite areas with sporadical occurrence of sandstones (**pescar**i) and marlstones (**laporci)** accumulated at the end of the Paleogene period so that lithological content is pretty simple.

The main part of the terrain is represented by sediments originated from Mesozoic and Paleogenic structures which appear along with greater dislocation in narrow strings.

Key words: radon, radon concentration, Cr – 39 detectors, limestone, dolomite, dislocations.

MEASUREMENT OF GAMMA DOSE RATE IN HOSPITAL AS FOR REHABILITATION IN BULGARIA

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Abstract: The gamma dose rate in the air was measured in 355 rooms in 17 inspected hospitals for rehabilitation on the Bulgarian territory. The maximum value of the parameter was 0.390 μSv/h and the minimum value was 0.06 μSv/h with the arithmetic mean 0.157 μSv/h (standard deviation - 0.160). The gamma dose rate is within the natural variations of the parameter in buildings. Direct measurements of radon were conducted and range of the results were from 12 Bq/m3 to 3920 Bq/m^3. The relationship between the two parameters was examined. A weak correlation between gamma dose rate and indoor radon concentration was found. The measurement of gamma dose rate could be useful parameter for carrying out the radon workplace control.

Key words: gamma dose rate, hospitals, radon, Bulgaria, direct measurement.

APPLICATION OF NANOTECHNOLOGY IN THE AUTOMOTIVE INDUSTRY

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Abstract: Nanotechnology arised after mobile telephony and the Internet and at the cross of the 20th and 21st centuries became the main science of the 21st century. It quickly found application in all domains of human activity such as electronics, mechanical engineering, medicine, pharmacy, construction, etc. This article presents the application of nanotechnology and advanced materials in the automotive industry: in the protection of metal and plastic surfaces, improvment the quality of tires, obtaining high quality oils, in the production batteries for electric cars, coating glass surfaces and protection from precipitation and water droplets.

Key words: application of nanotechnology, protection of metal and plastic car surfaces, oil production.

PERFORMANCE ANALYSIS OF RAID 5 ARRAYS OF SSDS

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Abstract: RAID is a technology that allows multiple data storage devices to be connected into a single logical unit that becomes a single storage space. RAID technology enables the connection of multiple storage devices so that their total capacity and speed are used in the best possible way to store data while maintaining the integrity of the data in the event of failure of any of these disks. Until recently, RAID technology was primarily intended for hard drives.

However, the reduction in the price of SSD devices has significantly increased their application in data storage, so there is a need to analyze the performance of RAID arrays that make up these devices. RAID 5 level gives all the advantages of RAID technology both in theoretical expectations and in practical measurements.

The addition of each new device increases storage space and performance, and the use of bit parity ensures integrity. Practical implementation brings some limitations and problems that in some cases of a poorly configured array, can lead to a fall in overall system performance.

Analysis of the impact of configuring a RAID 5 array can best be done based on measuring write and read speeds. The parameters that were changed during the measurement are stripe unit size, workload block size, queue depth, and the number of devices that make up the RAID 5 array of the SSD.

Key words: disk array, RAID 5, system performance, strip unit, workload, queue depth.

MEASURING THE PERFORMANCE OF A RAID 1 SERIES OF SSDS

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Abstract: Of all the RAID arrays, RAID 0 and 1 are the most widespread. With falling prices and mass production, SSDs have become very affordable for the average user as well.

Thanks to this, this RAID combination often finds its application even on home computers. There are several reasons: they are the simplest, cheap to implement, they can work with at least 2 devices, they are not too complex to understand, set up and use, and they also give very concrete and usable results. RAID 0 applies striping, and RAID 1 applies mirroring. While RAID 0 does not provide

any data protection in the event of a device failure, RAID 1 ensures data integrity. Namely, data is written to two or more SSD devices at the same time, which directly affects the performance of the array in relation to the characteristics of one SSD device.

Namely, the total capacity of the array is equal to the capacity of one device and theoretically, it is expected that there will be no reduction in write speed, but it is expected to double or multiply (depending on the number of disks in RAID) a higher read speed.

It is possible to read different blocks of data from independent devices in RAID at the same time. In case of failure of one SSD device, copies of all data exist and after replacing the defective device with a new one, a copy of the data is restored on it.

System performance depends on parameter settings. RAID 1 was implemented through SSD disks and write and read speeds were measured depending on the size of the strip block, the size of the workload, and the queue depth.

Key words: RAID 1, data integrity, write speed, read speed, stripe unit, workload size, queue depth.

QUANTUM CRYPTOGRAPHY PROTOCOLS USING POLARIZED PHOTON DETECTION SIMULATED IN CRYPTOOL

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Abstract: In this paper some principles of Quantum Cryptography and Quantum Key Distribution (QKD) based on polarized photon transmission through an optical fiber or a similar medium, are applied.

The process of mapping a sequence of bits to a sequence of rectilinearly and diagonally polarized photons, reffered to as conjugate coding, is simulated in Cryptool, according to the BB84 protocol.

Key words: Quantum Key Distribution, photon polarization, quantum alphabet, the BB84 protocol, Cryptool.

COMPARISON OF DOSIMETRIC LEAF GAP FOR TWO VARIAN TRUEBEAM LINEAR ACCELERATORS

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Abstract: The aim of this study was to compare dosimetric leaf gap (DLG) for two Varian TrueBeam linear accelerators. The Eclipse treatment planning system (TPS) (Varian Medical Systems, Palo Alto, CA) must model complex motions of the Multileaf colimator (MLC) to deliver the intended dose according to the prescribed dose constraints.

It is important to model accurately the MLC characteristics defined in the TPS, such as the dosimetric leaf gap (DLG), in order to deliver the correct dose to patients. The DLG values for all photon beam were measured on two Varian TrueBeam linear accelerators (Varian Medical Systems, Palo Ato, CA) equipped with Millennium 120 MLC.

Measurements were performed with a Farmer-type ion chamber. DLG parameters for TrueBeam 1 and TrueBeam 2 are presented in the table 1.

Table 1. Dosimetric leaf gap (DLG) for two TrueBeam linear accelerators

	DLG [cm]				
Beam energy	6MV	10MV	16MV	6FFF	10FFF
TrueBeam 1	1.45	1.61	1.62	1.33	1.57
TrueBeam 2	1.5	1.64	1.61	1.366	1.56

The DLG is used in the Varian Eclipse treatment planning system as an approximation factor to reduce the dosimetric calculation uncertainty arising from the use of a simple MLC model with straight leaf ends.

Results of the DLG in this study are showing that the difference in the calculation uncertainty will be less than 3% for two machines.

Key words: Dosimetric leaf gap, TrueBeam.

COMPARISON OF THE PERFORMANCE OF PAIRED ARRAYS OF MAGNETIC DISKS RAID 0, RAID 5 AND RAID 50

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Abstract: Magnetic disks (HDDs) are still the basis for storing large amounts of data. On the other hand, the dimensions have practically reached their theoretical limits. The requirements that are set are largely contradictory: the higher the speed, capacity and reliability, the lower the cost of memorized information. By using arrays of independent (and cheap) paired disks (RAID) it is possible to largely meet all these requirements. There are several ways to implement RAID arrays, but in practice, they are mostly used: RAID 0 to increase the capacity and speed of reading and RAID 5 which additionally ensures data reliability and the possibility of recovery in the event of a single disk failure. In practice, their combination is also used: RAID 50. The characteristics of the arrays of paired disks depend on many parameters: the size of the array (N, number of disks), the size of the data block on the disk (Stripe Unit, SU), workload, workload Queue Depth, QD). Final performance depends on the setting of these parameters and in case of poor selection, a number of disks may have poorer performance than a single disk. The paper presents comparative characteristics of read and write data speeds for paired disk arrays: RAID 0, RAID 5 and RAID 50. Measurements of write and read speeds for all three types of RAID arrays were made for different sizes of data blocks on the disk (SU): very small 8KB, medium 64KB and very large 1MB.

Key words: RAID 0; RAID 5; RAID 50; data block; workload; queue depth; array size.

DEPLETED URANIUM AS RADIATION PROTECTION MATERIAL IN RADIOTHERAPY

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Abstract: Natural uranium contains three isotopes, uranium-234 (0.005%), uranium-235 (0.7%) and uranium-238 (99.3% percent by mass). Through the

enrichment process (fission fuel), the share of uranium-235 increases from 0.7% to (3-5)%. A by-product of the enrichment process is depleted uranium (DU) with uranium-234 (0.002%) and uranium-235 (0.2%). DU is a weaker irradiator (by around 40%) than the natural uranium. Due to its high density (19.1 g/cm^3, 1.7 times denser than lead), although radioactive itself, DU is suitable as a protective material against ionizing radiation for radiotherapy (RT) bunkers. Half-value layer (HVL) is a thickness that reduces the dose to 50%. For gamma beam Co-60 (energies 1.17 and 1.33 MeV), HVL values for materials most commonly used for shielding in radiotherapy are given in table 1.

Table 1. HVL values of shielding materials most commonly used in RT.

	HVL (cm)			
	Concrete	Steel	Lead	DU
Co-60	6.2	0.216	0.125	0.69

DU reduces the thickness of the protective walls (bunkers), in which the radiotherapy Co-60 device is placed, to a size 9 times smaller than concrete. Since it is itself radioactive, DU requires additional protection against ionizing radiation (alpha, beta and gamma) generated in the barrier as a result of radioactive decay. Increasingly, radiotherapy centers around the world are opting for DU as an optimal solution for protection, especially due to space savings.

Key words: depleted uranium, radiation protection, half value layer.

COMPARISON OF PERFORMANCE OF ADATA, KINGSTON AND SAMSUNG RAID 0 ARRAYS OF PAIRED SSDS

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Abstract: Film technology and the dimensions of memory cells have practically reached their theoretical limits. The increase in capacity and performance of secondary memories has slowed significantly in the last ten years. By using a range of independent (and inexpensive) paired SSDs, it is possible to greatly increase these features. In practice, RAID 0 is mostly used to increase the capacity and speed of reading because they are very easy to implement (with at least two devices). RAID 0 arrays of solid state drives do not ensure data reliability and the possibility of recovery in case of failure of at least one disk. Although there are a large number of SSD manufacturers, the three largest are Adata, Kingston and Sam-

sung. The paper presents the measurement of RAID 0 arrays with two and three SSD devices for each of the mentioned types and compares the obtained results. When performing measurements, in addition to the number of devices paired in the array (array size), the parameters related to the size of the data block to be stored or read (workload), as well as the number of parallel input and output operations, performed simultaneously (queue depth) were varied.

Key words: secondary memory performance; RAID 0, Adata, Kingston, Samsung, data block, workload, queue depth, array size.

GENETIC ENGINEERING IN THE FUNCTION OF PRODUCTION AND ABUSE OF BIOLOGICAL WEAPONS

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Abstract: This long-awaited spring and summer, which we have all been looking forward to, has been dominated by "force" in modern international relations - an invisible enemy, this time perhaps the most dangerous biological agent - the Corona virus (COVID-19). The main source of infection was the populous world power China, and then it moved violently (with numerous ways of spreading) to all parts of the world (in Italy, Spain, Iran and the USA the most).

So, this suddenly appeared virus, which caused a pandemic, fear and panic to humanity all over the planet Earth, should neither be underestimated nor overestimated. Biological weapons include organisms or toxins that can be used to kill, disabling and preventing the opponent, and in addition to what can be produced, we also find it in natural environment.

It is characterized by a high degree of toxicity, is poorly observed and relatively easy distributes. This type of weapon causes mass casualties, a large number of injured and exposed people who need medical attention, and the pollution that can occur is a constant danger.

It also differs from classic weapons in that it is easier to hide, and its price is much lower, so it is partly because some countries have perfected and sweetened it in large quantities for military use. Truths and misconceptions about it are at every step, and science, biochemists, doctors and ecologists are now a priority task - to discover the real effects and consequences, and quickly find the right solution for prevention, bio-chemical protection and elimination of consequences, with quality and accuracy informing the public through the mass media.

We intend to to put on the light events that are the consequence of human mistakes, and that shuold be avioded in the future, discuss potentional threat and

consequences, tell something abuut intentional epidemia spreding, and possible and needed prevention.

Destiny of now and future society will depened on domination of mechanistic approach to reality and an projecting of safety paradigm i.e. sustainable development. So, the aim of this work is to indicate the importance realization of this concept.

Finally, we want to pay your attention, and sugesst measures that should be the enterprise of the highest levels in the aim of epidemic prevention and protection, to avoid enormous catastroph.

Key words: biological weapons, corona virus, genetic engineer, abuse, pandemic, remediation, eco-safety.

THE POSSIBILITY OF APPLYING SMART PIPES IN PRESSURIZED SYSTEMS, AS AN INTEGRAL PART OF THE WATER MANAGEMENT ACTIVITIES, WITH SPECIAL EMPHASIS ON THE WATER SUPPLY SYSTEMS

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Abstract: The development of the water economy and the increased need for water of the population and industries contributes to the need for new innovative solutions that will enable a stable supply of the population, industry, agriculture and energy with the required quantities of water. The main and irreplaceable element in providing the required amounts of water are the pipes that are installed in the pressure systems.

The current types of pipes used in the water economy, can not continuously follow the trends in the distribution of quantities of water that is variable during 24 hours and during 365 days. In this paper, a new concept for the development of pipes used in pressure systems will be presented.

Key words: Pressure systems, water supply, irrigation, energy, smart pipes.

APPLICATION OF NANOTECHNOLOGY ACHIEVEMENTS IN TARGETED DELIVERY OF PHARMACOLOGICAL THERAPIES IN THE TREATMENT OF CARDIOVASCULAR DISEASES

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Abstract: Considering the participation of cardiovascular diseases in the general health of the world population, as well as modern scientific and technological achievements, it is concluded that efficient and targeted delivery of drugs is a strategy without alternative in the treatment of a wide range of these diseases. The use value of nanometer-sized carriers for drug delivery within the heart depends on several factors, the most important of which are: specifics of target tissues, and finding appropriate nanostructures as carriers of pharmacological drug substance, whose task is to bind to target biomolecules. In this way, targeted delivery of the drug to a specific place is ensured, with minimal risk of impact on other tissues and organs. This paper provides an overview of current nanotechnological achievements in the treatment of pathological conditions of the myocard and new therapeutic effects on the treatment of cardiac diseases, with an emphasis on the perspective of clinical use of nanoparticles in the future.

Key words: nanotechnology, nanoparticles, targeted drug delivery, cardiology.

FREQUENCY OF THIRD MOLARS HYPODONTIA

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Abstract: AIM: In this investigation, the aim was to define frequency of missing third molar germs in a sample of 231 children (119 girls and 112 boys), 14 to 18 years old. The reason that was defined sample by this age was aspect of more authors who believes that 13 years of age is final time limit for genesis of third molar germs.

MATERIAL and METHOD: Investigation was based on orthopanthomograph analysis of those patients and determination of third molar germs existence.

RESULTS: 176 (76.2%) investigated were with all third molar germs, but 55 (23.8%) were with missing of this tooth. Missing of all 4 third molar germs were found in 13 (23.6%), missing of 3 third molar germs were found in 4 (7.3%), missing of 2 third molar germs were found in 19 (34.5%) and one missed third molar germ was found in 19 (34.5%) too. In the sample of 112 boys were found 27 (24.1%) with missing third molar germs, but most of them were with one missing: 10 (37%) investigated. In the sample of 119 girls were found 28 (23,5%) with missing third molar germs, but most of them were with two missing: 13 (46,4%) investigated.

CONCLUSION: Missing third molar germs are relatively frequent phenomenon, mostly in the lower jaw.

Key words: third molars, hypodontia, frequency.

EVALUATION OF SURFACE HARDNESS AND COLOR STABILITY OF MAXILLOFACIAL SILICONE ELASTOMER MODIFIED WITH ZNO NANOPARTICLES: THE EFFECT OF ARTIFICIAL AGEING

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Abstract: *Introduction*: Maxillofacial prosthetics representing a science and art of anatomical, functional, and cosmetic reconstruction by means of artificial replacement of head and neck structures that are missing or defective. Silicone elastomers are the materials most commonly used to make these prosthetics. In maxillofacial area, this materials are exposed to various ekstraoral environmental factors, that can adversely affect the mechanical and physical properties of this material. Two major problems, associated with maxillofacial prostheses, used to rehabilitate patients with oralfacial defects are: 1) the degradation of static and dynamic physical properties of elastomers, and 2) discoloration of the prostheses in a service environment. Scientific studies have found satisfactory results by incorporating different kind of nanoparticles (NPs) into maxillofacial silicone elastomers, in terms of protecting such materials from degradation.

Aim: The purpose of this in vitro study was to evaluate the influence of adding ZnO nanoparticles on the surface hardness and color stability of pigmented silicone maxillofacial prosthetic elastomers. The properties tested were selected because of their important clinical significance.

Material and methods: Color evaluation were performed on 60 colored silicon specimens, divided into three groups: I - spaciements modified with 1% ZnO nanoparticles, II - speciement modified with 2% ZnO nanoparticles, III – control non modifed speciements. Outcomes were measured before and after accelerated aging for color changes as well as for surface hardness values. Data were analyzed by variance (ANOVA) and Tukey honest significant differences test (α=.05).

Results: Results showed that the presence of nanoparticles influenced the properties of the assessed groups. Modification of facial silicon by ZnO nanoparticles increasede hardness values. The highest values of surface hardness were observed for the groups with addition of 2 % ZnO NP, group without NP showed the lowest values of surface hardness. ZnoO modified specimens showed minimal or no color change, representing significant color stability after being subjected to outdoor weathering.

Conclusion: Based on the findings of this in vitro study, the modification of maxillofacial silicon elastomer material by addition of ZnO nanoparticles can be recommended.

Key words: maxillofacial protesis, silicon elastomers, ZnO nanoparticles, surface hardness, color stability.

CHOSEN APPLICATIONS AND APPROACHES TO MODELLING LASER USE IN DENTISTRY

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Abstract: Historically, although the first indications for the use of lasers in general were in dentistry as a relief from the sound of the drill and mechanical contact, it still seems somewhat that the entry in various ways of lasers in dentistrywas slower. This also applies to the continents (USA much later approved the application relative to Europe). This paper will analyze the potential and existing applications of lasers in dentistry in a wide range of existing types, including interaction with dental tissues, in terms of surgical applications, on living tissue, prosthetic side of applications and therapeutic doses. There is a special role that can be seen from the precise determination of the color of the material (teeth and prosthetics) and in general the definition of the composition of the material including classic but also modern laser techniques LIBS, complement, tooth tissue, bone), and especially from the first Q switch systems related to pain reduction beca-

use the short pulse favors the intervention rate / ns and ps. Special attention will be paid to modelling of interaction and analysis with appropriate software support.

Key words: laser,dentistry,interactions with tooth tissues.

TREATMENT OF DENTOAL VEOLAR DEEP BITE AND CROWDING BY FIXED APPLIANCES (CASE REPORT)

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Abstract: AIM: The aim of this case was to show treatment of dentoalveolar deep bite and crowding in permanent dentition by fixed appliances.

MATHERIAL AND METHOD: In this case female patient in the age of 19 years was treated by upper and lower fixed appliances. Patinet had forward facial rotation, decreasing value of basal angle, retrusion of the upper and lower frontal teeth and moderate crowding in the upper and lower jaw.

Patient used intermaxillary elastics for Class II in the final stage of treatment. After 26 months treatment was finished and fixed appliances were removed.

CONCLUSION: Patient in permanenetdenition can be treated by fixed appliances to achieve stabile occlusion and correct overjet of 3mm and overbite of 3mm after orthodontic treatment. Now patient wear retention splints without signs of relapse.

Key words: deep bite, crowding, orthodontic treatment, fixed appliance.

EFFICACY OF SODIUM LAURYL SULFATE FREE TOOTHPASTE IN REDUCING THE FEELING OF DRY MOUTH

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Abstract: Introduction: The feeling of dry mouth accompanied by burning sensation is a chronic symptom that occurs most often in adults who have some

systemic diseases, and the mucous membrane of the oral cavity shows a clinically healthy appearance.

Material and methods: 30 subjects (24 women and 6 men), aged 50 to 60 years, participated in the study. Subjects reported symptoms of dry mouth, which were accompanied by burning sensation. The anamnestic procedure determined that these were secondary symptoms, ie the presence of systemic diseases that were treated with drug therapy was established in the subjects.The vast majority of subjects stated that they suffer from high blood pressure and diabetes, as well as that they are exposed to stress. The first step in reducing the feeling of dryness is to change the hygienic-dietary regime. Toothpastes containing sodium lauryl sulfate (SLS) as well as mouthwashes (alcohol-based mouthwaters are excluded) for seven to ten days are excluded from the hygiene regime. In this study we used Enzycal toothpaste for seven to ten days.

The control group consisted of 30 subjects, with the same subjective problems, in whom the hygienic-dietary regime was not changed. The Visual Analogue Scale (VAS) scale monitored the effectiveness of this toothpaste in reducing feelings of dry mouth, such as burning sensation.

Results: The obtained results show that the use of sodium lauryl sulfate free toothpaste significantly alleviates the feeling of dry mouth, as well as the symptoms of burning sensation in the area of the oral cavity.

Conclusion: Based on the results of this study, sodium lauryl sulfate free toothpaste can be recommended for maintaining oral hygiene.

Key words: dry mouth, burning sensation, sodium lauryl sulfate free toothpaste.

NATURAL PRODUCTS AND CARIES

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Abstract: Despite the remarkable progress in the control of dental caries achieved with the use of fluorides, due to their limited capabilities, it has not yet been put under control. For thousands of years, various herbal products (fruits, herbs, spices) have been used for the purpose of traditional treatment of various disorders in organism, and thus diseases of teeth and mouth. Only in the last decades efforts have intensified on finding active principles and possible clinical practices. Through their secondary metabolism, herbs produce numerous compounds that they use in fight

against UV radiation or various external aggressive Noxa (bacterial infection, viruses and fungi, oxidative stress and etc.). The most famous groups of herbal phytochemicals are heterosides (the most important representatives are: polyphenols and bioflavonoids), alkaloids, essential oils, saponins, terpenes, etc.

Phytochemicals work in several ways: 1. stimulating the remineralization process, 2. action on biofilm, 3. substitute for sugars (natural sweeteners) and 4. combined action. The greatest advantage of natural products is that they do not disturb the ecological system of the oral microbiome and are well tolerated by the tissue.

The most famous natural products and active phytochemicals, for which there is evidence that they act anticariogenic and when used in natural and processed anti (extracts) form are: 1) *Green tea* (fluorides, polyphenols: catechins and ECg); 2) *Cranberries* (polyphenols proanthocyanidins), 3) *Propolis* (polyphenols apigenin and tt-farnesol); 4) *Salvadora Persica* whose root has been used in Muslim world and Asia for centuries to clean teeth under the name Miswak (fluorides, polyphenols *benzylisothoicyanate* -BIT, saponins, tannins; 5) *Azadirachta Indica* plant known in Asian traditional medicine as Neem (triterpenoids); 6) *Galla (Rhus) chinesis* known as Chinese sumac (gallotannins); 7) *Pomegranate* (polyphenol ellagitannin); 8) Cocoa (*alkaloid theobromine from group of xanthenes to which both caffeine and theophylline belong) is mostly found in cocoa and tea; 9) Acacia (gum arabic) stimulates remineralization even without the presence of fluoride; 10) Citrus fruit (Hesperidin bioflavonoid); Stevia rebaudiana* (glycosides Stevioside and Rebuodioside A).

Some of the products like Miswak are also officially recommended as possible replacements for brushing teeth with fluoride. Others can be used between meals insteadof cariogenic food. In recent years, intensive work has been done on the extraction of anticariogenic phytochemicals and their application in dental products and medicines. There are already commercial products with herbal products on the market, but additional clinical trials are needed. It is considered that there is no enough data that they can replace fluorides.

Key words: natural products, dental caies, polyphenoles in dentistry, green tea, oral health.

NANOMATERIALS FOR DRUG DELIVERY

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Abstract: Drug delivery system is to control the releasing profile of a drug at a designed rate in a targeted area to ultimate the function of the drug. By having the

concept of drug delivery systems, it is necessary to know what properties drug delivery systems should ideally have. Drug delivery systems can facilitate drugs across cell membrane or other biobarriers; enable drugs to localize in or target specific areas like local cancers; can protect drugs from macrophage clearance or self-degradation; drug release may be controlled upon environmental change, such as temperature and pH or external signal (e.g., near-infrared (NIR) light and ultrasound); and drug delivery systems can minimize side effect of drugs but in the meanwhile maintain or even enhance their therapeutic effect. Drug delivery nanomaterials can be: micelles and liposomes, polymer sistems, dendrimers, carbon nanotubes, metal nanotubes, quantum dots, nanoporous devices, fullerenes and nanowheels.

Key words: nanomaterials, drug delivery, control.

USING OF SELF-LIGATING BRACKETS (DAMON SYSTEM) IN TREATMENT OF CROWDING – A CASE REPORT

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Abstract: Self-ligating system is used very often in modern orthodontic practice during treatment of crowding, if it is desirable to avoid extraction in some cases. Treatment with this system could provide enough space for correct position of all teeth in the dental arch.

The aim of this report was to show effects of self-ligating system in patient with crowding in permanent dentition.

In this case male patient in the age of 12 years and 5 months was treated with Damon system in both jaws. Before treatment study casts analysis, orthopantomograph, lateral cephalogram, intraoral and extraoral photos have been done. Missing space was 3mm in the upper and 7.5mm in the lower jaw, both jaws were narrow, overjet was 4 mm, overbite 4 mm and patient had ½ Class II occlusion. On the lateral cephalogram angle ANB was 3.5˚, angle I/SpP 68˚, angle i/MP 80˚, angle I/i 111.5˚, sum of angles of Bjork`s polygon was 392˚.

Whole treatment has been finished after 18 months. After treatment study casts, intraoral and extraoral photos and lateral cephalogram have been done. On the and of treatment patient had stabile occlusion (Class I), angle ANB was 3˚, I/SpP 65˚, i/MP 80˚, I/i 120˚, sum of angles of Bjork`s polygon 394˚, overjet was 2.5mm and overbite 3mm.

Now, patient is in retention period without sings of relapse.

Key words: crowding, orthodontic treatment, self-ligating brackets.

APPLICATION OF EXPERIMENTAL DESIGN IN OPTIMIZATION OF CHROMATOGRAPHIC METHOD FOR PHARMACEUTICAL ANALYSIS OF AMLODIPINE BESYLATE, INDAPAMIDE AND PERINDOPRIL-ERBUMINE

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Abstract: High blood pressure increases the risk of heart attack and stroke, which are the two leading causes of death in the developed world. It is often impossible to achieve the required therapy with just one drug, and the production of fixed combinations of 2 or more drugs is the ideal solution. In order for such a drug to be on the market, a comprehensive analysis in terms of efficacy, safety and quality is necessary. This requires the development of new methods, which are environmentally safe, but also methods that are cost-efficient for the industry. In this paper, the aim was to develop a new reverse-phase liquid chromatographic method (RP-HPLC) for the simultaneous determination of amlodipine besylate, indapamide and perindopril erbumine. To develop the method and find the optimal conditions, an experimental design was applied to examine the influence of critical factors on the chromatographic system: organic solvent content (methanol) in the mobile phase as a "greener" solvent, then buffer strength, mobile phase pH and column temperature. After optimization of the method, other validation parameters were examined. The method proved to be specific, sensitive, accurate and precise for this type of analysis.

Key words: amlodipine-besylate, indapamide, perindopril-erbumin, reverse-phase liquid chromatography, design of experiments, greener solvents.

NEW APPROACHES IN CONTROL OF DENTAL BIOFILM OMEOSTASIS

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Abstract: Dental biofilm is a physiological formation, and changes in its ecology (dysbiosis) trigger pathological metabolic-immune processes, which include the most common human diseases such as caries and periodontitis. Changes in ecology are the result of the external influences, primarily in diet (free sugars); pro-

cess of lactic acid fermentation changes the pH which suppresses commensal microbiota and stimulates the formation of extracellular matrix which begins the maturation of biofilm and blocs the activity of protective mechanisms from salvia. In the new conditions, a pathogenic microbiome develops with consequent reactions on hard and soft tissues. The current approach in biofilm approach is based on non-specific action such as its mechanical removal in combination with fluorides (oral hygiene) or the action of broad spectrum chemical agents. Despite a certain level of reduction in prevalence, especially caries, it is not satisfactory, because the action is focused on the complete bacterial flora and the it attacks the useful species (microbiota), and allows the creation of persistent and resistant strains. In recent years, resistance to fluorides has also increased, and there are also certain risks with their use in younger generation.

Due to this, in recent decades, research has focused on finding mechanisms that will act to stimulate the ecology of a healthy microbiome in a biofilm (homeostasis) and selectively inhibit the dominance of pathogenic microbiota.

The Paper presents new ecological methods in biofilm control such as:

1. Prebiotics; 2. Probiotics; 3. Antibacterial enzymes; 4. Selective carriers of antimicrobial agents such as antibacterial and remineralization peptides; 5. Peptides that block the binding of cariogenic bacteria to the tooth surface; 6. Quorum quenching based agents (signal inhibition between bacteria – quorum sensing); 7. Application of nanoparticles.

The mechanisms of preserving healthy ecological organization in biofilm are different, from 1. specific effect on pathogenic species or activation of antimicrobial activity only in pathological environment such as pH drop in cariogenic u biofilm (antibacterial peptides, nanoparticles, probiotics), 2. stimulation of metabolic activities creating alkaline environment (prebiotics), 3. insertion of genetically modified (e.g. do not produce acids)bacteria that replace „wild“ pathogenic species (probiotics), 4. prevent the binding of bacteria to the tooth surface or mutual cooperation (peptides, quorum quenching).

The most of these contemporary methods have been mainly tested in in vitro and in situ experiments and are still in the final stages of clinical studies, and a smaller number are in commercial application, but certainly represent the future in prevention and treatment of dental diseases and as an advanced supplement to oral hygiene and fluorides.

Key words: Dental caries, dental biofilm dysbiosis, oral antimicrobial agents, nanotechnology in dentistry, probiotics.

ANALYTICAL SOLUTION OF FRACTIONAL FLOW RESERVE IN EVALUATION OF CORONARY ARTERY STATE

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Abstract: The derivation of FFR from the Poiseuille`s equation and the relationship between FFR and the degree of stenosis is shown. Fractional flow reserve (FFR) is the "gold standard" for assessing the physiological significance of coronary artery disease during invasive coronary angiography. Blood flow through blood vessels can be expressed by the Poiseuille`s equation and using Poiseuille's law to calculate the narrowed vessel's hemodynamic resistance. The myocardial fractional flow reserve (FFR) is clinically used as a stenosis-specific index. The relation between the FFR and the degree of stenosis (defined as the fractional cross sectional area narrowing) was investigated, including the influence of the aortic and venous pressures and the capillary resistance. Studies have shown that the fractional flow reserve has a high correlation with non-invasive indicators of myocardial ischemia during exercise testing, such as dobutamine stress echocardiogram, stress echocardiography and scintigraphy, as well as combination of these methods.

Key words: Fractional flow reserve, Poiseuille`s equation, stenosis.

COMPARISON OF COMPRESSIVE STRENGTH OF EXPERIMENTAL CALCIUM-ALUMINATE CEMENTS WITH MTA AND PORTLAND CEMENT

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Abstract: Objectives: The aim of this study was to compare compression strength of commercial dental cements (MTA, Portland cement) used for retrograde root canal obturation with experimental calcium-aluminate cements.

Method: Compression strength of materials was performed using a tensile testing machine (Shimadzu AGS-X), capacity 100kN. For this purpose, the tested materials were cast in the form of 10 cylinders (length 6 mm, diameter 4 mm) in specially designed Teflon molds. Samples were immersed for a period of 30 days in phosphate buffered solution (PBS). The measurements were performed at the time of sample cracks, 24 h after sampling from the PBS solution.

Results: MTA, Portland cement and calcium-aluminate cement with added strontium-fluoride showed similar values of compression strength (32.65 MPa, 28.01MPa, 25.52MPa, respectively), without statistically significant differences between them (One-Way ANOVA: Post hoc-Scheffe test; $p > 0.05$). Pure calcium-aluminate showed the highest value of compressive strength (59.61MPa) (statistically significant difference compared to all other examined groups, $p<0.05$).

Conclusion: Compression strength is an indicator of the bonding reaction as well as the stability of the material. The compressive strength of pure calcium-aluminate cement showed a significantly higher value compared to all other tested groups including MTA, (One-Way ANOVA: Post hoc-Scheffe test; $p <0.05$), which is a significant advantage over other surveyed cements.

Key words: retrograde obturation of the root canal, dental cements, MTA, calcium-aluminate based cements.

INFLUENCE OF RECTOVAGINAL INFECTION BY GROUP B STREPTOCOCCUS ON THE OUTCOME OF PREGNANCY

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Abstract: *Streptococcus agalactiae*, also known as Group B *Streptococcus* (GBS), was first differentiated in the 1930s after it was isolated from milk and cows with bovine mastitis. Colonization of the vaginal tract of women, was not described until 1938. Invasive GBS disease was rarely identified in humans until the 1960s, when increasing reports of adult and neonatal invasive infection. Regnancy has been associated with a high incidence of invasive GBS disease.

Asymptomatic rectovaginal colonization rates among pregnant women vary widely worldwide although the majority of estimates fall between 5%−30%. Group B *Streptococcus* is the leading etiology of culture-confirmed neonatal bacterial infection in the US and resulting in significant mortality. Invasive neonatal GBS disease may be divided into early onset disease (EOD), occurring <7 days of life,

and late onset disease (LOD) occurring between 7–90 days of life. Worldwide, incidences of EOD is 0.09/1000 live births in Japan, 0.58/1000 live births in Panama, 0.76/1000 live births in Hong Kong.

Risk factors for EOD disease include maternal vaginal or rectal GBS colonization, GBS bacteriuria during pregnancy, prolonged labor, prolonged rupture of membranes, low birth weight, prematurity, intrapartum fever, and systemic maternal disease.

The aim of this study was to examine the prevalence of rectovaginal GBS infection in the population of pregnant women between 35 and 37 weeks of gestation, distribution by parity, age, maternal C reactive protein values, neonatal C reactive protein values, appearance of neonatal skin manifestations and early neonatal infection GBS.

Key words: Streptococcus agalactiae, newborn, infection.

TREATMENT OF CROWDING BY EXTRACTION AND FIXED APPLIANCES – CASE REPORT

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Abstract: AIM: The aim of this study was to determine and show way of orthodontic treatment of crowding in permanent dentition.

MATHERIAL AND METOD: In this case was treated girl in the 14 years of age. Missing space in the lower jaw was 11.5mm (severe crowding) and 4.5mm in the upper jaw. Patient had dental Class I and skeletal Class II. Plan of treatment was extraction of all first premolars and using of upper and lower fixed appliances.

RESULTS AND CONCLUSION: Patient wore fixed appliances for 24 months. After treatment patient had stabile occlusion in Class I, with overbite 2mm and overjet 2mm. Now patient is in period of retention, without sings of relapse and wear splints in both jaws every night.

Key words: crowding, extraction treatment, fixed appliance.

MANDIBULAR OVERDENTURE RETAINED BY TWO IMPLANTS: SATISFACTION AND FUNCTIONAL ASSESSMENTIN EDENTULOUS PATIENT – CASE REPORT

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Abstract: Purpose: Human life expectancy has been increasing at a rapid rate and dental practise shows more and more completely edentulous patientsor patients with indication of extraction of teeth because of severe periodontitis. Main goal in dentistry, when it comes to edentulous patients, is to avoid bad chewing efficiency, speech problems and other problems caused by functional instabilityof dentures in advanced bone ridge resorption in the lower jaw, and to provide better quality of life.

Materials and Methods: After teeth extraction, instead of cheap removable acrylic denture patient is offered with mandibular overdenture retained by biocompatible locator attachments on two biocompatible Straumann titanium implants.

Results: On his first check-up, patient points out prosthesis stability, speaking and chewing comfort with positive results on general health, simple oral hygiene and overall – satisfaction with the choice of the treatment plan.

Conclusion: Overdenture retained by low number of dental implantsis a reliable therapy which providesgood functional stability and retentionto patients. And since this is a non-expensive solution,patients get value in life-quality improvement without facing great financial expenses.

Key words: overdentures, implants, locator attachments, life-quality.

PRINCIPLES AND OBJECTIVES FOR FLOOD RISK ASSESSMENT AND MANAGEMENT

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Abstract: The occurrence of large river waters, ie the occurrence of flood waves on natural watercourses in urban areas is a challenge of engineering and scientific approach in flood risk management assessment, ie flood protection by causing minimal material damage to buildings and other real estate. property that is directly endangered by flood waves. In order to better protect the urban environments located in the immediate vicinity of natural watercourses, comprehensive measures should be taken to protect material goods from the risk of floods. Met-

hods for scientific and professional analysis are the Hydrological analysis of the watercourses, the Hydraulic analysis of the watercourses as well as the Urban Architectural analysis with the Ecological analysis of the riverbed.

Key words: Hydrological analyzes, Hydraulic analyzes, River catchment area, Rainfall time schedule, Flow quantities.

ENGINEERING PRACTICE AND IDEAS SOLUTIONS IN DEVELOPING FLOOD PLANS

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Abstract: The engineering practice for finding conceptual solutions for the development of flood protection plans is based on theoretical knowledge of hydrotechnics and water management and practical experiences from previous floods. level, which are in charge of flood protection and improvement of methods and ways of flood protection, thus gaining new knowledge that is implemented in engineering practice. Engineering practice in the development of flood defense plans has a great tradition and experience that with certain modifications can be successfully applied to any watercourse that poses a potential danger to the human environment from floods.

Key words: Slush area, Precipitation intensity, Accumulations, Time schedule of precipitation, Flow rates. River regulation facilities.

SUSTAINABLE DEVELOPMENT AND INTEGRATED WATER MANAGEMENT OF THE REPUBLIC OF SRPSKA

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Abstract: Based on the documents and conclusions of numerous United Nations Conferences accepted by the Republic of Srpska on the environment and development, a global environmental program and frameworks for sustainable development in the twenty-first century have been defined. The paper offers definitions of sustainable development and integrated water management of the Republic of Srpska, discusses the elements of strategic planning in water management, especially analyzes the sustainable development of water resources. The global objectives of the integrated water resources management are to improve water quality, provide techni-

cal and organizational means and measures to achieve water management goals and unite all those involved in addressing issues of environmental protection, water and sustainable development. Integrated water management must always strive to balance different water needs and interests and ensure that the available amount of water is used optimally. This is a great challenge for Republic of Srpska in the coming period.

Based on the documents and conclusions of numerous United Nations Conferences accepted by the Republic of Srpska on the environment and development, a global environmental program and frameworks for sustainable development in the twenty-first century have

Key words: sustainable development, integrated water management, strategic planning.

ECONOMIC CONTRIBUTION FROM WASTE GENERATED IN THE MANUFACTURING INDUSTRY

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Abstract: The main reason for writing of this paper is to point out the economic contribution to which waste which originated in the processing industry can contribute. After every industrial manufacturing and so also after the processing industry, in addition to the suitable product which originated as a consequece of manufacturing, a certain quantity of waste also originates. Waste which originates also represents a big problem for the manufacturer, primarily in respect of disposal and taking care of that waste on the landfill. Certain types of waste have a possibility of reuse through the process of recycling which can contribute that a new product is again obtained from the originated waste which represents an economic contribution in savings in respect of materials, decreased is the need for reuse of natural resources, it also comes to opening of new workplaces primarily in respect of employing of workers in the process of recycling. This paper provides a greater number of information which have an objective to gain insight into the main notions on waste, recycling as well as on advantages of a circular economy. In the paper, data was used of the Republic's Institute of Statistics of the Republic of Srpska on the quantity of waste which originates in the processing industry. The subject of this paper refers to the economic benefit which can originate from reuse of waste originated in the processing industry.

Key words: Waste, processing industry, recycling, new product, economic contribution.