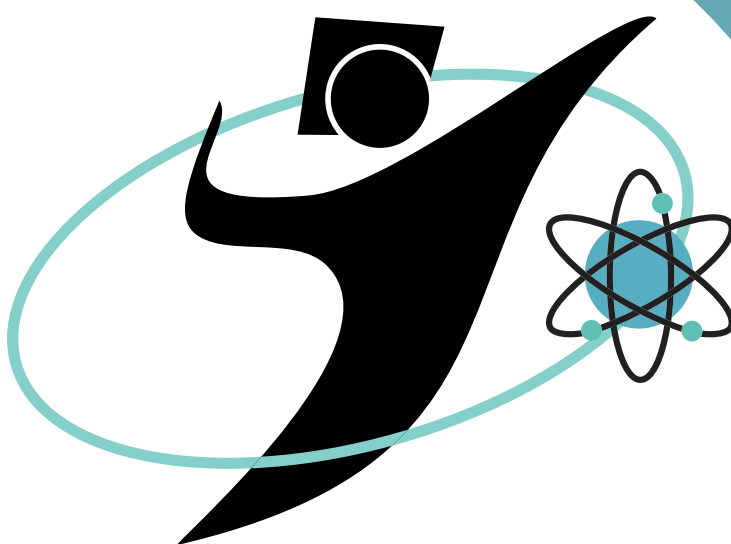


**ŠTUDENTSKI SIMPOZIJ
PROJEKTA INSPIRO
2023**

ZBORNİK POVZETKOV

VIPAVA, 5. OKTOBER 2023



INSPIRO

Zbornik povzetkov študentskega simpozija projekta INSPIRO
(Inovativni študentski projekti v raziskovalnem okolju)

5. 10. 2023

Univerza v Novi Gorici, Dvorec Lanthieri, Vipava

Uredila: Mladen Franko, Katja Mihurko

Tisk: Arttech, d.o.o.

Leto: 2023

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REPUBLIKA SLOVENIJA
**MINISTRSTVO ZA VISOKO ŠOLSTVO,
ZNANOST IN INOVACIJE**



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Študentski simpozij projekta INSPIRO 2023

5. 10. 2023

Univerza v Novi Gorici, Dvorec Lanthieri, Vipava

Program:

10.30–10.45 Otvoritev

(nagovori rektorja UNG, predstavnikov MIZŠ in koordinatorja projekta INSPIRO)

10.45–12.05 Predstavitve rezultatov študentskih projektov – sklop 1

10.45 *Mila Marinković*: Vizualizacije podatkov v zbirki PISMA: kulturna dediščina na presečišču informatike in literarne vede / Data visualizations in the “PISMA” collection: cultural heritage at the intersection of informatics and literary science

11.05 *Mojca Drevenšek*: Krepitev energetske in podnebne pismenosti z mikroučenjem in odprtimi izobraževalnimi viri/ Strengthening energy and climate literacy with microlearning and open educational resources

11.25 *Gros Matevž*: Prilagoditev dajalnika zasuka zahtevam stranke / Adaptation of a rotary encoder to customer requirements

11.45 *Amina Uglješa*: Zasnova in izvedba nadzornega modula kot dela sistema za spremljanje in nadzor stanja na trdno-oksidnih elektrolizerjih / Design and implementation of the supervisory module as part of a system for condition monitoring and control of solid oxide electrolysis cell systems

12.05–13.30 Odmor

13.30–14.30 Predstavitve rezultatov študentskih projektov – sklop 2

13.30 *Erik Perkavac*: Priprava tankih plasti bakrovega oksida za uporabo v polprevodnikih / Preparation of copper oxide thin films for semiconductor applications

13.50 *Lučka Godec*: Raziskava fotokatalitske redukcije Cr(VI) / A study of photocatalytic reduction of Cr(VI)

14.10 *Volodymyr Rodin*: Začetne faze rasti organskih polprevodnikov na bazi tiofena na kvazi-dvodimenzionalnih polimerih poliacetilena / Initial stages of growth of thiophene-based organic semiconductors on quasi-two-dimensional polyacetylene polymers

14.30 *Lea Gelo*: Karakterizacija tankih filmov molekul BODIPY / Characterization of BODIPY molecule thin films

14.50–15.10 Odmor



15.10–16.10 Predstavitve rezultatov študentskih projektov – sklop 3

15.10 *Matevž Može Davidovič*: Analiza hitrosti sproščanja antibiotikov iz biokompozitnih materialov za uporabo v medicini / Analysis of the rate of release of antibiotics from biocomposite materials for medical use

15.30 *Ivana Sulaver*: Viri generacije visokih harmonikov in laserji na proste elektrone: temeljit pogled na lastnosti sevanja in znanstvene aplikacije / High-harmonic generation sources and free electron lasers: a close look at radiation properties and scientific applications

15.50 *Jakob Žvab*: Iskanje novih meglic s teleskopom GoChile/ Discovering new nebulae with GoChile

16.10–18.00 Zaključek in druženje



Vizualizacije podatkov v zbirki PISMA: kulturna dediščina na presečišču informatike in literarne vede

Mila Marinković ⁽¹⁾

Katja Mihurko ⁽²⁾, mentorica

⁽¹⁾ Fakulteta za računalništvo in informatiko, Univerza v Ljubljani, Ljubljana, Slovenija.

⁽²⁾ Raziskovalni center za humanitiko, Univerza v Novi Gorici, Nova Gorica, Slovenija.

Pisma so dragocene zgodovinske, kulturne in osebne oblike komunikacije, ki zagotavljajo obilo informacij za raziskovanje in raziskovanje. Ponujajo vpogled v preteklost in življenja posameznikov ter v njihova razmišljanja, zanimanja in povezave z dopisniki in lahko prispevajo k boljšemu razumevanju zgodovine, kulture in človeških izkušenj. Ker iz vsakega pisma dobimo ogromno podatkov, jih lahko z vizualizacijo podatkov poenostavimo in razjasnimo tako, da jih predstavimo v eni sami sliki.

Ta raziskava se osredotoča na zbiranje informacij iz spletne zbirke pisem (www.pisma.org), napisanih v 19. in 20. stoletju in označenih z metapodatki. Za boljše razumevanje obdobja so bili metapodatki uporabljeni za izdelavo različnih vizualizacij, ki omogočajo npr. tematsko analizo pisem, geografsko analizo in razmerje med številom pisem obeh spolov glede na posamezno temo ali po letih.

Data visualizations in the “PISMA” collection: cultural heritage at the intersection of informatics and literary science

Mila Marinković ⁽¹⁾

Katja Mihurko ⁽²⁾, mentor

⁽¹⁾ University of Ljubljana, Faculty of Computer and Information Science, Ljubljana, Slovenia.

⁽²⁾ Research Centre for Humanities, University of Nova Gorica, Nova Gorica, Slovenia.

Letters are valuable historical, cultural, and personal forms of communication that provide a wealth of information for exploration and research. They offer an insight into the past and the lives of individuals as well as their thoughts, interests, and connections with correspondents, so they can contribute to a better understanding of history, culture, and human experiences. Since we get a huge amount of data from each letter, using data visualization we aim to simplify and clarify data by representing them in a single image.

This research focuses on gathering information from an online collection of letters (pisma-rch.ung.si) written during the 19th and 20th centuries, that are enriched with metadata. To gain a deeper understanding of the period, the provided metadata are used for creating various visualizations that perform e.g. letter thematic analysis, geographical analysis, the ratio between the number of letters of both genders according to the individual topic or per year.



Krepitev energetske in podnebne pismenosti z mikroučenjem in odprtimi izobraževalnimi viri

**Mojca Drevenšek⁽¹⁾
Tanja Urbančič⁽¹⁾, mentorica**

⁽¹⁾ Poslovno-tehniška fakulteta, Univerza v Novi Gorici, Nova Gorica, Slovenija.

Cilj raziskovalnega projekta je razviti pristop neformalnega izobraževanja in ozaveščanja, ki bo mlade (med 18 in 35 let) motiviral k aktivnemu vključevanju v sooblikovanje energetske in podnebne prihodnosti.

Izhodiščno razpravo s skupino mladih smo izvedli s pomočjo uporabe slovenske jezikovne različice energetske-podnebnega interaktivnega spletnega orodja En-ROADS, ki spodbuja sistemsko razmišljanje. Na podlagi ugotovitev razprave smo razvili inovativna učna gradiva in učne dejavnosti. Osredotočili smo se na prakse odprtega izobraževanja in soustvarjanja odprtih izobraževalnih virov (OIV), podprtih z mikroučenjem prek družbenih medijev. V aktivnem sodelovanju z mladimi in strokovnimi sodelavci društva ENLITE smo na Instagramu odprli @en_pismenost, izobraževalni kanal za mikroučenje o energiji, podnebnih spremembah in povezanih temah, ter razvili in objavili prosto dostopen odprt spletni tečaj, poimenovan Energetski prehod, dostopen prek www.en-lite.si.

Strengthening energy and climate literacy with microlearning and open educational resources

**Mojca Drevenšek⁽¹⁾
Tanja Urbančič⁽²⁾, mentor**

⁽¹⁾ School of Engineering and Management, University of Nova Gorica, Nova Gorica, Slovenia.

The research project aims to develop a non-formal educational and awareness-raising approach to motivate youth (aged 18 to 35) to actively engage in the co-creation of our energy and climate future.

The starting discussion with a group of youth representatives was implemented with the use of the Slovenian language version of En-ROADS, an interactive online energy and climate simulation tool that fosters systems thinking. Based on the discussion's findings, we developed innovative learning materials and learning activities. We focussed on open education and the co-creation of open educational resources (OER), supported by microlearning via social media. In active collaboration with youth representatives and the ENLITE Society's expert team, we launched @en_pismenost, an educational channel for microlearning about energy, climate and related topics on Instagram, and designed and published a freely available, open online course titled Energy transition, which can be accessed here: www.en-lite.si.



Prilagoditev dajalnika zasuka zahtevam stranke

Matevž Gros⁽¹⁾

Juš Kocijan⁽¹⁾, mentor

⁽¹⁾ Poslovno-tehniška fakulteta, Univerza v Novi Gorici, Nova Gorica, Slovenija.

Dajalniki položaja so senzorji, ki se uporabljajo za meritev translatorsnega premika ali za meritev zasuka ter posledično tudi hitrosti merjenja. Imajo širok spekter uporabe, prevladuje pa vgradnja v različne robote. Stranke za svoje aplikacije občasno potrebujejo prilagojen dajalnik položaja. Poleg tega imajo zaradi različnih potreb željo po izdelavi lastne programske opreme za dajalnike premika ali zasuka. Namen diplomskega dela je prilagoditev dajalnika zasuka AksIM-2 zahtevam stranke in izdelava programske opreme, ki jo lahko stranka prilagodi po lastnih željah. Za zagotovitev pravilnega delovanja dajalnika zasuka smo izvedli teste točnosti in histereze. Programsko opremo smo zasnovali v programskem jeziku Python. Za prikaz delovanja programa smo izdelali demonstracijsko mesto, ki je sestavljeno iz koračnega elektromotorja in nosilca za bralno glavo MB080. Nosilec smo narisali v programski opremi Solidworks, izdelali tehniško risbo, 3D-natisnjen model in rezkan nastavek.

Adaptation of a rotary encoder to customer requirements

Matevž Gros⁽¹⁾

Juš Kocijan⁽¹⁾, mentor

⁽¹⁾ School of Engineering and Management, University of Nova Gorica, Nova Gorica, Slovenia.

Position sensors are devices used to measure translational displacement or rotation, and consequently, the velocity of the measured object. They have a wide range of applications, the most common being their instalment in various robots. Customers occasionally require customized position sensors for their specific applications. Additionally, they sometimes request to develop their own software for encoders. The purpose of my thesis is the adaptation of the AksIM-2 rotary encoder in such a way that it meets the requirements of the customer and the development of customizable software in line with their preferences. To ensure proper operation of the rotary encoder, tests were conducted. The software was designed using Python. To demonstrate the program's functionality, a demonstration setup was created, consisting of a stepper motor and an MB080 readhead holder. The holder was designed using Solidworks software. Technical drawings, a 3D-printed model, and a milled attachment were made.

Diplomsko delo, ki ga predstavlja ta prispevek, je bilo opravljeno v podjetju RLS Merilna tehnika d.o.o.

The diploma work presented in this contribution was carried out in the company RLS Merilna tehnika d.o.o.



Zasnova in izvedba nadzornega modula kot dela sistema za spremljanje in nadzor stanja na trdno-oksidsnih elektrolizerjih

Amina Uglješa ⁽¹⁾

Đani Juričič ⁽²⁾, mentor

⁽¹⁾ Poslovno-tehniška fakulteta, Univerza v Novi Gorici, Nova Gorica, Slovenija.

⁽²⁾ Institut »Jožef Stefan«, Ljubljana, Slovenija.

Trdno-oksidsne elektrolizne celice (SOEC) predstavljajo novo tehnologijo za proizvodnjo vodika iz pare in električne energije. Žal, delovanje pri visokih temperaturah povzroča degradacijo materiala, kar ima za posledico prehitro uničenje celice. Ena izmed rešitev je vgraditev naprave, ki je sposobna sproti spremljati notranje stanje sistema in optimizirati njegovo delovanje.

H2020 projekt REACTT je eden prvih poskusov izdelave vgrajenega sistema za spremljanje, diagnostiko, prognostiko in optimizacijo delovanja sistema SOEC (MDPC). Delo pomembno prispeva k projektu v obliki realizacije nadzornega modula (supervisor), ki koordinira delovanje različnih modulov sistema MDPC, kot so moduli za zbiranje podatkov, optimizacijo, diagnostiko, prognostiko in svetovanje korektivnih posegov. Dinamično delovanje je modelirano z diagrami prehodov stanj. Koda je narejena v Pythonu skladno z zahtevami projekta in implementirana na Raspberry Pi 4. Izvedeno je testiranje prve funkcionalne verzije kode.

Design and implementation of the supervisory module as part of a system for condition monitoring and control of solid oxide electrolysis cell systems

Amina Uglješa ⁽¹⁾

Đani Juričič ⁽²⁾, mentor

⁽¹⁾ School of Engineering and Management, University of Nova Gorica, Nova Gorica, Slovenia.

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Solid oxide electrolysis cell (SOEC) is an emerging technology to produce hydrogen from steam and electrical energy. However, operating at high current and electrical transients cause degradation that leads to premature end of life. A remedy is to implement a hardware module capable to perform online condition monitoring and optimization of SOEC systems.

The H2020 project REACTT is the first attempt to build an embedded system for monitoring, diagnosis, prognostics, and control (MDPC) for SOEC system. The thesis contributes to the project in the form of the realization of a supervisory module, which coordinates the operation of different MDPC modules such as data acquisition, optimization, diagnosis, prognostics, and mitigation. The dynamic operation of the supervisor is modelled by state transition diagrams. The code is done in Python in a way that complies with the project requirements and implemented on Raspberry Pi 4 platform. The first functional version of the code is also tested.



Priprava tankih plasti bakrovega oksida za uporabo v polprevodnikih

Erik Perkavac ⁽¹⁾
Saim Emin ⁽²⁾, mentor

⁽¹⁾ Fakulteta za znanosti o okolju, Univerza v Novi Gorici, Nova Gorica, Slovenija.

⁽²⁾ Laboratorij za raziskave materialov, Univerza v Novi Gorici, Nova Gorica, Slovenija.

Tanke plasti bakrovega klorida (CuCl) smo pripravili s tehniko elektrodepozicije. Tanke plasti CuCl so bile ustvarjene na površini stekla iz kositrovega oksida, dopiranega s fluorom. S spreminjanjem napetosti, koncentracije raztopine in trajanja nanašanja smo lahko vzpostavili idealne pogoje za nanašanje filmov CuCl, da bi ugotovili, kateri pogoji so ugodni za ustvarjanje tankih filmov z najboljšimi lastnostmi fototoka, ki se lahko uporabijo kot začetni material za proizvodnjo bakrovega oksida (CuO). Dobljene filme CuCl smo nato oksidirali v peči, da smo ustvarili tanke filme CuO. Razlog za izdelavo tankih filmov CuO je, da so to obetavni materiali za uporabo v fotoelektrokemičnih aplikacijah, kot je proizvodnja vodika ali redukcija CO₂. Fotoaktivnost tankih plasti CuO smo analizirali s tehniko linearne voltametrije. Strukturne in morfološke karakterizacije filmov CuO so bile izvedene z rentgensko difrakcijo, optično mikroskopijo in vrstično elektronsko mikroskopijo. Ta elegantna metoda omogoča izdelavo čistih faz CuO z dobrimi lastnostmi, ki bi jih lahko izkoristili v polprevodniških aplikacijah.

Preparation of copper oxide thin films for semiconductor applications

Erik Perkavac ⁽¹⁾
Saim Emin ⁽²⁾, mentor

Affiliations: (1) School of Environmental Sciences, University of Nova Gorica, Nova Gorica, Slovenia.

(2) Materials Research Laboratory, University of Nova Gorica, Nova Gorica, Slovenia.

Thin films of copper chloride (CuCl) were prepared using an electrodeposition technique. The CuCl thin films were grown on the surface of a fluorine-doped tin oxide glass. By varying the voltage, solution concentration, and deposition duration, we were able to establish the ideal conditions for the deposition of CuCl films, to determine which conditions yield thin films with the best photocurrent properties, which can be used as a starting material to produce copper oxide (CuO). The obtained CuCl films were then oxidized in a furnace to generate CuO thin films. The rationale behind creating CuO thin films is that these are prospective materials for use in photoelectrochemical applications such as hydrogen generation or CO₂ reduction. The photoactivity of CuO thin films was analysed using the linear sweep voltammetry technique. The structural and morphological characterizations of the CuO films were carried out using X-ray diffraction, optical microscopy, and scanning electron microscopy. This elegant method allows the generation of pure CuO phases with good characteristics that could be exploited in semiconductor applications.



Raziskava fotokatalitske redukcije Cr(VI)

Lučka Godec ⁽¹⁾

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Raziskava se osredotoča na spremljanje fotokatalitske redukcije rakotvornega Cr(VI) do Cr(III), v prisotnosti fotokatalizatorja TiO₂ in osvetlitvi z UV svetlobo. Pri tem smo kot analitski tehniki uporabili spektrometrijo s toplotnimi lečami (TLS) in spektrometrijo UV-Vis. Rezultati prikazujejo fotolabilnost kompleksa Cr z difenilkarbazidom (Cr-DPC), kar pomeni, da je potrebno pri fotokatalitski redukciji Cr-DPC v prisotnosti fotokatalizatorja upoštevati tudi njegovo fotorazgradnjo. Za spremljanje fotokatalitske redukcije Cr(VI) smo razvili novo metodo, ki temelji na določevanju nastalega Cr(III) s TLS in omogoča spodnjo mejo detekcije Cr(III) pri 0,3 ng/mL. Ugotovitve in rezultati prikazani v delu pa hkrati pripomorejo k razvoju varnejših in učinkovitejših fotokatalitskih tehnik za ugotavljanje prisotnosti strupenih kovinskih ionov.

A study of photocatalytic reduction of Cr(VI)

Lučka Godec ⁽¹⁾

Swapna Mohanachandran Nair Sindhu ⁽²⁾, mentor

⁽¹⁾ Faculty of Chemistry and Chemical Engineering, University of Maribor, Maribor, Slovenia

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The present work focuses on monitoring the photocatalytic conversion of carcinogenic Cr(VI) to Cr(III) species using TiO₂ as a photocatalyst under UV illumination. As analytical techniques we employed the thermal lens spectrometry (TLS) and UV-visible spectrometry. The results revealed the photolability of Cr-diphenylcarbazide complex (Cr-DPC), emphasizing the necessity to consider its photodegradation when dealing with the photocatalytic reduction of Cr-DPC in the presence of a photocatalyst. To monitor the photocatalytic reduction of Cr(VI) we have developed a new method based on TLS detection of formed Cr(III), which offers an LOD of 0.3 ng/mL. These findings provide valuable information for the development of a safer and more effective photocatalytic remediation techniques for removal of toxic metal ions in water.



Začetne faze rasti organskih polprevodnikov na bazi tiofena na kvazi-dvodimenzionalnih polimerih poliacetilena

Volodymyr Rodin ⁽¹⁾

Nadiia Pastukhova ⁽²⁾, **Egon Pavlica** ⁽²⁾, **mentorja**

⁽¹⁾Fakulteta za naravoslovje, Univerza v Novi Gorici, Nova Gorica, Slovenija.

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Tradicionalni polprevodniki služijo številnim aplikacijam, vendar zaradi togosti ne nastopajo v fleksibilnih napravah. Nasprotno dvodimenzionalni konjugirani polimeri (2DKP) predstavljajo potencialno rešitev zaradi svoje mehanske prožnosti. Izmerili smo morfologijo tankega filma 2DKP in jo primerjali z meritvami transporta naboja. Za topografijo 2DKP so značilne 30 nm globoke luknje s premerom nekaj sto nanometrov. Poleg tega imajo ti filmi več mikronov velike gube, katerih dolžina je več sto mikrometrov. Ugotovili smo, da gube ne motijo transporta naboja, saj je njihova gostota razmeroma nizka in je mogoče dobiti pot v ravnini filma, ki popolnoma prepreči križanje z gubami. Po drugi strani pa naši rezultati kažejo, da manjše luknje povzročijo eksponentno temperaturno odvisnost mobilnosti naboja z aktivacijsko energijo $13,8 \pm 3,8$ meV. Te luknje predstavljajo perturbacijo površine in potencialna mesta za rast majhnih organskih polprevodniških molekul na osnovi tiofena, ki se nanesejo z naprepanjem molekul na površino 2DKP.

Initial stages of growth of thiophene-based organic semiconductors on quasi-two-dimensional polyacetylene polymers

Volodymyr Rodin ⁽¹⁾

Nadiia Pastukhova ⁽²⁾, **Egon Pavlica** ⁽²⁾, **mentors**

⁽¹⁾School of Science, University of Nova Gorica, Nova Gorica, Slovenia.

⁽²⁾Laboratory for Organic Matter Physics, University of Nova Gorica, Nova Gorica, Slovenia.

While traditional semiconductors serve numerous applications, their inherent rigidity limits their adaptability in flexible devices. In contrast the two-dimensional conjugated polymers (2DCPs) represent a potential solution due to their mechanical flexibility. We have measured the morphology of 2DCP thin film and correlated it with charge transport measurements. The 2DCP topography is characterized by 30nm deep crates of the diameter of several hundred nanometers. In addition, these films exhibit microns-large wrinkles, which lengths is of several hundred micrometers. We found that wrinkles do not interfere with the charge transport, since their density is relatively low and a pathway can be obtained in the plane of the film, which completely avoids crossing with wrinkles. On the other hand, our results show that crates introduce Arrhenius-like temperature dependence of charge mobility with activation energy of 13.8 ± 3.8 meV. These crates represent depressions and potential sites for the growth of thiophene-based small organic semiconducting molecules, which are deposited by molecular beam epitaxy on top of 2DCP.



Karakterizacija tankih filmov molekul BODIPY

Lea Gelo ⁽¹⁾

Barbara Ressel ⁽²⁾, Tina Škorjanc ⁽³⁾, mentorici

⁽¹⁾ Fakulteta za naravoslovje, Univerza v Novi Gorici, Nova Gorica, Slovenija.

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Molekula BODIPY je fluoroforna molekula, ki ima velik potencial in že obstoječe aplikacije na več področjih, od fotodinamične terapije do fotovoltaike. Da bi razumeli njeno obnašanje, smo se odločili preučiti elektronske lastnosti tankih plasti dveh molekul BODIPY, in sicer 1,3,5,7-tetrametil-2,6-dietil-8-(4-karboksifenil) BODIPY in 1,3,5,7-tetrametil-8-(3-(N,N-dimetilaminometil)-4-hidroksifenil) BODIPY klorid. *In-situ* smo pripravili tanke filme in jih nanесли na silicijev substrat zaščiten s 30 nm zlata. Filme smo karakterizirali s SEM-om, da smo preverili njihovo morfologijo in sestavo. Kasneje je bila fotoelektronska spektroskopija uporabljena za raziskovanje valenčnega pasu filmov. S primerjavo spektrov pri vklopljeni in izklopljeni črpalni LASER je bilo mogoče izmeriti učinek črpalke.

Characterization of BODIPY Molecule Thin Films

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BODIPY molecule is a fluorophore molecule that has a big potential and already existing applications in several fields ranging from photodynamic therapy to photovoltaics. To understand its behaviour, we decided to study the electronic properties of the thin films of two BODIPY molecules, namely the 1,3,5,7-tetramethyl-2,6-diethyl-8-(4-carboxyphenyl) BODIPY and the 1,3,5,7-tetramethyl-8-(3-(N,N-dimethylaminomethyl)-4-hydroxyphenyl) BODIPY chloride. The thin films were prepared *in-situ* and deposited on a silicon substrate, protected by 30 nm of gold. The films were characterized by SEM to check their morphology and the composition. Subsequently, photoelectron spectroscopy was used to investigate the valence band of the films. Finally, it was possible to measure the effect of the LASER pump, comparing the spectra with the pump on and off.

Analiza hitrosti sproščanja antibiotikov iz biokompozitnih materialov za uporabo v medicini

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Antibiotiki so bistvenega pomena v medicini za zdravljenje različnih bolezni in okužb. Določene antibiotike lahko tudi vgradimo v biokompozitne materiale, saj imajo ti že sami želene protibakterijske lastnosti in so biokompatibilni. Zaradi teh lastnosti smo v raziskovalnem delu analizirali hitrosti sproščanja amoksicilina (AM), gentamicina (GT) in ciprofloksacin (CF) iz biokompozitov, sintetiziranih iz celuloze in hitosana v razmerju 25:75% ter 10, 30, ali 50% dodanih očiščenih zrn cvetnega prahu (ZCP) v katera so bili vnešeni antibiotiki. Za analizo absorpcijskih spektrov antibiotikov smo uporabili spektrometrijo UV-vis. Hitrost sproščanja antibiotikov iz biokompozitov smo proučevali s tehniko spektrometrije s toplotnimi lečami (TLS) in dosegli spodnje meje zaznavanja (LOD) 1,7 mg/L za AM, 4,4 mg/L za GT ter 0,6 mg/L za CF. Ugotovili smo, da so hitrosti sproščanja antibiotikov, preračunane na 1 mg biokompozita, največje za GT in dosegaajo vrednosti 0,29 µg/min za 10 % ZCP, 0,34 µg/min za 30 % ZCP in 0,61 µg/min za 50 % ZCP v biokompozitu. Za AM in CF hitrosti sproščanja antibiotika ne presegajo vrednosti 0,1 µg/min.

Analysis of the rate of antibiotics release from biocomposite materials for medical use

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Antibiotics are of high importance in medicine, as they are used to treat various diseases and infections. Certain antibiotics can be incorporated into biocomposite material as they already have desirable antimicrobial properties and are biocompatible. In this work we analyzed the rates of release of antibiotics amoxicillin (AM), gentamicin (GT) and ciprofloxacin (CF) from biocomposites composed of cellulose and chitosan in 25:75% ratio, with added 10, 30, 50% sporopollenin capsules (SEC) with incorporated antibiotics. UV-vis spectrometry was used to record the absorption spectra of antibiotics. The rates of antibiotics' release from biocomposites were determined by the use of thermal lens spectrometry (TLS). The achieved limits of detection (LOD) were 1.7 mg/L for AM, 4.4 mg/L for GT and 0.6 mg/L for CF. It was found that the rates of antibiotics' release, recalculated for 1 mg of biocomposite, are the highest in case of GT and reach the values of 0.29 µg/min for 10% SEC, 0.34 µg/min for 30% SEC, and 0.61 µg/min for 50% SEC in the biocomposite. For AM and CF the rates of release from biocomposites do not exceed 0.1 µg/min.



Viri generacije visokih harmonikov in laserji na proste elektrone: temeljnit pogled na lastnosti sevanja in znanstvene aplikacije

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Generacija koherentnih femtosekundnih impulzov v ultravijoličnem in rentgenskem spektralnem območju je odprla pot k boljšemu razumevanju snovi v in izven ravnovesja. Dve najbolj priljubljeni metodi, ki sta sposobni ustvariti takšne impulze, sta laserji na proste elektrone (LPE-ji) in procesi generacije visokih harmonikov (GVH) v plinu. V svojem govoru bom podala kratek pregled teh virov in pokazala, kako oblikovati tako časovne kot spektralne lastnosti sevanja s spreminjanjem nekaterih ključnih parametrov, ki so vključeni v procese, ki vodijo k oddaji LPE-ja in GVH. Primerjava teh dveh virov omogoča vpogled v vrsto eksperimentov, ki jih je mogoče izvesti z uporabo GVH ali LPE-ja. Kot primer bom pokazala, kako se lahko časovno in kotno-ločljiva fotoemisijaska spektroskopija uporabi za raziskovanje ultrahitrih procesov v kompleksnih materialih.

High-harmonic generation sources and free electron lasers: a close look at radiation properties and scientific applications

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The generation of coherent femtosecond pulses in the ultra-violet and X-ray spectral ranges paved the way to a better understanding of matter in out-of-equilibrium conditions. The two most popular sources, which are able to produce such pulses, are free electron lasers (FEL) and high harmonic generation (HHG) in gas. In my talk, I will give a brief overview of these sources and show the way to shape both the temporal and spectral properties of radiation, by varying some key parameters involved in the processes leading to FEL and HHG emission. The comparison of these two sources provides insight into what kind of experiments can be conducted using HHG or FEL. As an example, I will show how time and angle-resolved photoemission spectroscopy can be used for the investigation of ultrafast processes in complex materials.



Iskanje novih meglic s teleskopom GoChile

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Pri INSPIRO sem sodeloval z idejo iskanja novih meglic. Primarni cilj raziskave so bile planetarne meglice. Za cilj sem si zadal, da slikam dve potencialno novi odkritji. Našel in ovrednotil sem okoli 30 kandidatk. Zaradi časovne omejitve sem slikal le dve. Pri eni tarči sem bil uspešen, pri drugi pa za enkrat kaže da nekoliko manj. Pojavile so se težave z kalibracijskimi posnetki. Ko sem imel največ časa za slikanje pa je bilo vreme v Čilu nekoliko slabše. Težave na katere sem naletel me vseeno niso ustavile. Naredil sem sliko prve tarče, ki nosi ime RebZva1, v HOO kombinaciji. Prav tako sem naredil LRGB sliko te meglice. Meglica se pričakovano ne vidi, je pa zelo lepo videti zvezdo, ki bi po mojih pričakovanjih morala biti bela pritlikavka. Glede na barvo zvezde lahko sklepam, da gre zares za belo pritlikavko. Sedaj pa je potrebno počakati, da vesoljske agencije posnamejo spektralno analizo zvezde in meglice.

Discovering new nebulae with GoChile

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I participated in INSPIRO with the idea of searching for new nebulae. My primary focus was on planetary nebulae. My goal was to capture images of two potentially new discoveries. I assessed around 30 candidates. Due to the time limit I could have captured only two. I succeeded in one target, but it appears that the other did not give expected results. I faced some troubles with calibration frames. And when I had the most time for imaging, the weather in Chile was the worst this year. However, I still managed to capture an image of the first target, named RebZva1, in the HOO palette. I also created an LRGB image of this nebula. As expected, the nebula is not visible in broadband, but the stars showed their colors quite well. According to that, I can conclude, the star in the middle of the nebula is most likely a white dwarf. Now, we must wait for space agencies to gather a spectral analysis of the star and the nebula.



Beleške

