Institut "Jožef Stefan"
Jožef Stefan Institute

Kemijski inštitut
National Institute of Chemistry

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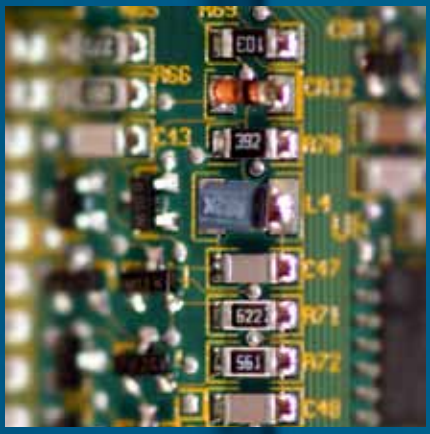
Razvojne priložnosti

Development opportunities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Vsebina

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Uvod

Pred vami je zbirka najnovejših tehnologij, ki so plod raziskovalnega dela na Institutu "Jožef Stefan" in Kemijskem inštitutu. Predstavljene tehnologije rešujejo različne probleme s področja nanotehnologije, keramike, informacijskih tehnologij, biotehnologije, novih energetskih virov, novih materialov, okoljskih tehnologij. Zaradi inventivnosti in novosti je večina predstavljenih tehnologij zaščitenih s patenti. Da bi tehnologije približali podjetjem, smo pripravili predstavitev tehnologij v brošuri »Razvojne priložnosti«. Pri vsakem opisu tehnologije je predstavljen problem, ki ga rešuje tehnologija, bistvo izuma, možnost uporabe tehnologije, glavne prednosti pred konkurenco, status intelektualne lastnine in glavni izumitelj tehnologije. S promocijo rezultatov raziskav in razvoja je mogoče pripomoči k vzpostavljanju boljše povezave med raziskovalno in gospodarsko sfero.

Introduction

In front of you is a collection of the latest technologies developed at the Jožef Stefan Institute and the National Institute of Chemistry, Slovenia. The presented technologes solve various problems from the field of nanotechnology, ceramics, information technology, biotechnology, new energy sources, new materials, environmental technologies. Due to their inventiveness and novelety, the majority of the presented technologies is protected by patents. To promote our technologies to companies we prepared brief description of each technology together with the main field of application, problem that is being solved, main advantages, inventor and the status of the intelectual property rights. The promotion of research and development can help to establish better connection between research and economic spheres.

Center za prenos tehnologij in inovacij (CTT)

Center za prenos tehnologij in inovacij (CTT) na Institutu "Jožef Stefan" (IJS) je samostojen center znotraj IJS, ki se finančno v celoti krije s svojimi lastnimi prihodki. Od leta 2011 CTT deluje skupaj s Kemijskim inštitutom (KI) kot Skupna pisarna za prenos tehnologij »Skupina TT« obeh inštitutov. Skupina TT ima deset sodelavcev.

Delovanje Centra za prenos tehnologij in inovacij obsega pet večjih med seboj povezanih področij:

1. Sodelovanje Instituta s podjetji doma in v tujini (pomoč pri povezovanju raziskovalcev z gospodarstvom za skupne raziskave, meritve, svetovanja)
2. Zaščita in trženje intelektualne lastnine (ocena tehnologij, trga in možnosti komercializacije tehnologij, patentiranje, licenciranje, ustanavljanje spin-out podjetij)
3. Pomoč pri pripravi sporazumov o varovanju poslovnih skrivnosti (NDA), pogodb o prevzemu in trženju tehnologij
4. Izobraževanja o prenosu tehnologij, stiki z javnostjo, izobraževanja, EU projekti
5. Raziskave na področju prenosa tehnologij

The Centre for technology transfer and innovation (CTT)

The Centre for technology transfer and innovation (CTT) at the "Jozef Stefan" Institute (JSI) operates as an independent centre within JSI and is fully financially supported with its own financial income. Since 2011 CTT works in conjunction with the National Institute of Chemistry as the Joint Technology Transfer office "Skupina TT" for both institutions. "Skupina TT" has ten collaborators.

The activities of the Centre of Technology Transfer and Innovation consists of five major inter-related areas:

1. Collaborations of institute with industry in Slovenia and abroad (assistance in connections of researchers with industry in carrying out collaborative research, measurements and consulting)
2. Intellectual property rights protection and management (technology assestment, market assestmen in order to evaluate the potential of particular technology, patenting, licensing, spin-out creation)
3. Support with the preparation of agreements on the protection of business secrets (so called Non-Disclousure Agreements), contracts for the acquisition and marketing of technologies
4. Teaching on Technology Transfer issues, public relations, organization of workshops and conferences, EU projects
5. Research in the field of Technology transfer

SKUPINA TT

Institut “Jožef Stefan”

Institut “Jožef Stefan” je bil ustanovljen leta 1949 in je z več kot 950 zaposlenimi največji inštitut v tem delu Evrope. Poslanstvo Instituta je v ustvarjanju, širjenju in prenosu znanja na področju naravoslovnih in tehniških znanosti ter znanosti o življenju.

Institut izvaja vrhunske raziskave in razvoj tehnologij, kot so nanotehnologije, novi materiali, biotehnologije, tehnologije vodenja in proizvodnje, komunikacijske tehnologije, računalniške tehnologije in tehnologije znanja, okoljske tehnologije in reaktorske tehnologijo.

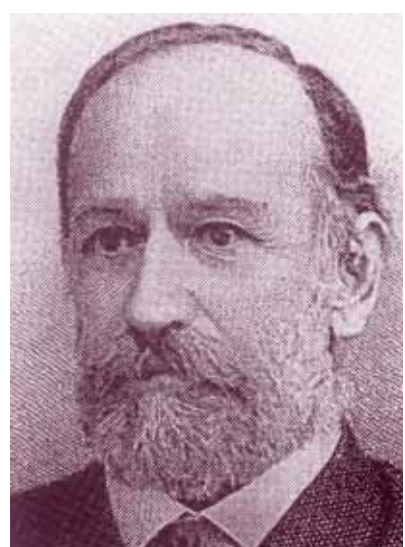
Raziskovalne enote Instituta so odseki in laboratoriji. V 28 odsekih se opravlja raziskovalna dejavnost Instituta, ki je glede na izbrana raziskovalna področja opredeljena kot dolgoročna programska usmeritev Instituta. Delovanje Instituta se financira preko projektov, za katere se Institut poteguje na domačem in tujem trgu tako v javnem kot v zasebnem sektorju. Največ projektov po številu in obsegu financira Javna agencija za raziskovalno dejavnost Slovenije, nekaj pa tudi Ministrstvo za izobraževanje, znanost, kulturo in šport. Sem spadajo predvsem raziskovalni programi, temeljni in aplikativni projekti, podoktorski projekti in projekti mladih raziskovalcev. Znaten del raziskav je financiran tudi iz evropskih sredstev in gospodarstva.

Jožef Stefan Institute

The Jožef Stefan Institute was established in 1949. The Institute is the leading Slovenian scientific research institute covering a broad spectrum of basic and applied research. The staff of more than 950 specializes in natural sciences, life sciences and engineering.

The mission of the Jožef Stefan Institute is the accumulation - and dissemination - of knowledge at the frontiers of natural science and technology to the benefit of society at large through the pursuit of education, learning, research, and development of high technology at the highest international levels of excellence. The subjects concern production and control technologies, communication and computer technologies, knowledge technologies, biotechnologies, new materials, environmental technologies, nanotechnologies, and nuclear engineering.

The JSI is financed through the national projects of the ministries of the Republic of Slovenia and the Slovenian Research Agency, international bilateral and multilateral projects and industrial projects in Slovenia and abroad. An important fraction of the JSI's revenues derive from international contracts and industry.



Kemijski inštitut

Kemijski inštitut je mednarodno priznana raziskovalna organizacija na področju kemije in sorodnih disciplin.

Ustanovljen je bil leta 1946 kot Kemijski laboratorij Slovenske akademije znanosti in umetnosti, danes pa deluje kot javni raziskovalni zavod na področju znanstvene in raziskovalno-razvojne dejavnosti.

Kemijski inštitut beleži 289 zaposlenih, od tega jih okoli 260 opravlja raziskovalno delo v 14 laboratorijih in dveh infrastrukturnih centrih. Osnovne in aplikativne raziskave so usmerjene na področja, ki so dolgoročno pomembna tako za Slovenijo kot v svetovnem merilu: biotehnologija, varstvo okolja, strukturna in teoretična kemija, analizna kemija, raziskave materialov in kemijsko inženirstvo; pri čemer je inštitut usklajen s potrebami domače kemične, farmacevtske, gumarske in živilske industrije. Delo inštituta je tudi v sozvočju s prednostnimi nalogami sedmega okvirnega programa EU, ki postavlja v ospredje genomiko in biotehnologijo za zdravje, nanotehnologijo, kakovost in varnost živil ter prehrane, trajnostni razvoj ter globalne spremembe.

Raziskave so usmerjene v razvoj novih tehnologij in izdelkov, ki bodo pomagali zagotavljati trajnostni razvoj Slovenije in so hkrati tudi mednarodno aktualni. Industrija je pri tem pomemben partner Kemijskega inštituta. To so mnoga slovenska podjetja, s katerimi ima inštitut vzpostavljeno tesno, v mnogih primerih tudi dolgoročno sodelovanje, na mednarodnem področju pa so to mnoga ugledna tuja podjetja. Cilj inštituta je povečanje sodelovanja z industrijo in povečanje inovativnosti raziskovalcev inštituta.

National Institute of Chemistry

The National Institute of Chemistry is internationally recognized research organization in the filed of chemistry and related disciplines.

In 1946, the Slovenian Academy of Science and Art (SAZU) established the SAZU Chemistry Laboratory which is today a public institution in the field of science, research and development.

The National Institute of Chemistry has 289 employees, of which around 261 carry out research work in 14 laboratories and two infrastructure centers. Basic and applied research are oriented towards fields which are of long-term importance to both Slovenia and the world: biotechnology, environmental protection, structural and theoretical chemistry, analytical chemistry, materials research, and chemical engineering, through which the institute is in line with the needs of the domestic chemical, pharmaceutical, tire, and food industries. The work of the Institute is also in line with the priority thematic areas of the 7th Framework Program of the EU, which places an emphasis on genomics and biotechnology for health, nanotechnology, quality and safety of food, as well as nutrition, sustainable development, and global change.

Research is oriented towards the development of new technologies and products, which will help to ensure the long-term development of Slovenia and which are internationally relevant. Industry is an important partner to the Institute in these endeavors. There are a number of Slovenian companies with whom the Institute has entered into close long-term cooperation, as well as a number of well-regarded foreign companies. From a financial point of view, this kind of cooperation represents 20% of the income of the Institute.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100
50

Tehnologije

Technologies

Legenda

Key

Ključne besede	Keywords
Uporaba	Applications
Odsek	Department
Pravice intelektualne lastnine	Intellectual property rights
Problem	Problem
Tehnologija	Technology
Prednosti	Advantages
Institut “Jožef Stefan”	Jožef Stefan Institute **IJS, JSI**
Kemijski inštitut	National Institute of Chemistry **KI, NIC**

Metoda in kapacitivnostni senzor za štetje aerosolnih nanodelcev

Method and capacitive sensor for counting aerosol nanoparticles

senzorji nanodelcev, nanodelci, kapacitivni senzor, štetje aerosolnih nanodelcev

aerosol sensors, nanoparticles, capacitive sensor, counting aerosol nanoparticles

okoljske tehnologije, detekcija in nadzor nanodelcev v proizvodnji in uporabi nanomaterialov

environmental sensing and monitoring technologies in the production and use of nanomaterials

IJS, F5, Fizika trdne snovi

JSI, F5, Condensed Matter Physics Department

Podeljen patent na tujem nacionalnem uradu

National patent granted at a foreign patent office

Aparature za merjenje nanodelcev v aerosolih so zapletene, drage, velike in težke, poleg tega zahtevajo pogosto vzdrževanje.

Currently used sensor devices for measuring nanoparticles in the aerosol are complex, expensive, large and heavy and need frequent servicing.

Razvili smo metodo za štetje nanodelcev v aerosolih na podlagi kapacitivnega senzorja. Aerosolski nanodelci, na katerih je v predhodnem procesu po znanih postopkih nanešena neka kapljevina, pri vstopu na področje dielektrika kondenzatorja spremenijo njegovo kapacitivnost, kar povzroči električni signal.Števec je primeren za detekcijo aerosolov na prostem in v zaprtih prostorih. Metoda je eksperimentalno dokazana in preverjena z numeričnimi simulacijami. Konstrukcija detektorja je relativno preprosta. Detektor, ki bi uporabljal tovrstno metodo za štetje nanodelcev, bi bil prenosen in poceni. Rezultat meritve je število nanodelcev vseh velikosti v enoti volumna pretočenega zraka. Možna je dograditev na razvrščevalnik nanodelcev po velikosti.

We have developed a method based on capacitive sensor for counting nanoparticles in aerosols. When aerosol nanoparticles in a previous process coated with liquid, enter the dielectric capacitor, dielectric capacitor changes its capacitance, which causes an electrical signal. Our detector can be used for monitoring aerosols outdoor and indoor. The method has been demonstrated experimentally and verified by numerical simulations. The construction of counter with our detector built-in, would be simple, portable and cheap. The measurement result is the number of nanoparticles of all sizes in a volume unit of air. Upgrade with the classifier of nanoparticles is possible.

- metoda je primerna za analizo aerosolov v širokem koncentracijskem območju
- metoda ni specifična za določeno obliko ali kemijsko sestavo nanodelcev
- števec omogoča izgradnjo prenosnega detektorja nanodelcev
- nizka cena detektorja
- možna masovna proizvodnja
- samočistilna funkcija
- nizki stroški obratovanja in vzdrževanja

- the method is suitable for detection of aerosols in wide concentration range in air
- the method is not specific for a shape or chemical composition of nanoparticles
- the counter allows a construction of a simple and portable nanoparticle detector
- price of a single sensor is low
- mass production is possible
- self-cleaning function
- low operating and maintenance costs

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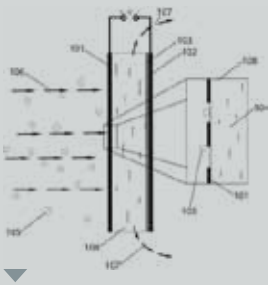

Stranski pogled kapacitivnostnega senzorja nanodelcev v zraku (Vir: M. Remškar, Odsek za fiziko trdne snovi)
Side view of a capacitive sensor for counting aerosol nanoparticles (Source: M. Remškar, Condensed matter physics)

Metoda za sintezo nanodelcev nitkastega volframovega oksida

Method for synthesis of threadlike tungsten oxide nanoparticles

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nanodelci, volframov oksid, nanomateriali	tungsten oxide nanoparticles, nanomaterials
nanotehnologije, nanoelektronika, litijeve baterije, senzorji	**nanotechnology, nanoelectronics, lithium batteries, sensors**
IJS, F5, Odsek za fiziko trdne snovi	JSI, F5, Condensed matter physics
Podeljen patent na tujem nacionalnem uradu	National patent granted at a foreign patent office

Nanomateriali se vse bolj uporabljajo v proizvodnji trdnih maziv, elektronskih naprav, katalizatorjev in super amortizerjev. Povpraševanje po novih nanomaterialih tako narašča in trenutno ni na voljo nanodelcev nitkastega volframovega oksida.

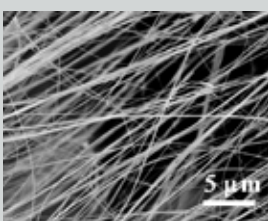
Nano-materials are increasingly used in the production of solid lubricants, electron devices, catalysts, super shock absorbers, and the demand for novel nano-materials has arose. Currently, the threadlike tungsten oxide nano-particles are not available.

Na Odseku za fiziko trdnih snovi smo razvili postopek za sintezo kristalov nitkastega volframovega oksida. Električno prevodne nitkaste kristale volframovega oksida smo sintetizirali v prisotnosti niklja z metodo kemijskega transporta v zaprti kvarčni ampuli. Tako pripravljeni kristali so uporabni za pripravo nanodelcev v industriji nanomaterialov. Nitkasti volframov oksid je osnova za sintezo nanocevk WS_2, nanokroglic WS_2 in nanobrstičev (angl. nanobuds) WS_2. Potencialna uporaba nitkastih WO_x je v senzoriki plinov, interkalaciji litija, poljski emisiji elektronov in v nanoelektroniki.

We have developed a method for synthesis of threadlike tungsten oxide nanoparticles. The electrically conductive threadlike crystals of tungsten oxide are synthesized by chemical transport method in the presence of nickel in a closed quartz ampule. These crystals are applicable for the production of nanotubes and are applicable in the industry of nanomaterials. The threadlike crystals of tungsten oxide are the basis for the synthesis of WS_2 nanotubes, WS_2 nanoballs and WS_2 nanobuds. Threadlike crystals of tungsten oxide are potentially applicable for gas sensors, intercalation of lithium, electron field emission and in nanoelectronics.

- Sinteza nitkastega volframovega oksida W_5O_{14} ob prisotnosti niklja pri temperaturah pod 1000°C omogoča sintezo električno prevodnih volframovih oksidov s paličasto oz. nitkasto obliko.
- Kristali W_5O_{14} imajo veliko razmerje med dolžino in premerom in kemijsko obstojnost, kar omogoča uporabo v polimerih za povečanje električne prevodnosti.

- Synthesis of threadlike tungsten oxide W_5O_{14} in the presence of nickel at temperatures below 1000°C allows the synthesis of electrically conductive tungsten oxides in the form of rods or threads.
- Crystals of W_5O_{14} have a large ratio of length to diameter and chemical resistance, allowing the use in polymers to increase the electrical conductivity.



Vrstični elektronsko mikroskopski (SEM) posnetek kristalov W_5O_{14}. (Vir: M. Remškar, Odsek za fiziko trdne snovi)
Scanning electronic microscopy (SEM) image of W_5O_{14} crystals (Photo: M. Remškar, Condensed matter physics)

Protimikrobni nanosi za ohranjanje čistosti površin

Antimicrobial coatings to maintain surface clean

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titanatni nanomateriali, antibakterijski premazi

titanate nanomaterials, antibacerial coatings

protimikrobni premazi za različne površine (polimerne, kovinske ali steklene), prehrambena industrija, zdravstvo, zobozdravstvo, kovinsko predelovalna industrija

antimicrobial coatings for very diverse surfaces such as polymeric, metal or glass surfaces

IJS, F5, Fizika trdne snovi

JSI, F5, Condensed Matter Physics

Skrivno znanje

Secret know how

Pogosta uporaba antibiotikov vodi k razvoju odpornosti na antibiotike, zato široka raba antibiotikov pri protimikrobni zaščiti površin ni priporočljiva. Alternativa antibiotikom za protimikrobno zaščito površin je uporaba močnih detergentov, ki pa so škodljivi za okolje.

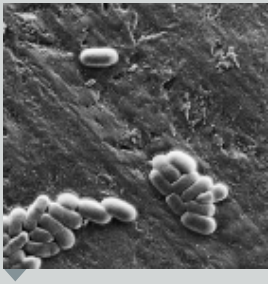
Frequent usage of antibiotics results in the development of antibiotic resistance, thus extensive usage of antibiotics is not advisable. The alternative to antibiotics for antimicrobial protection of surfaces is usage of strong detergents, which are however harmful to the environment.

Razvili smo materiale na osnovi titanatnih nanostruktur, ki pri osvetlitvi z naravno svetlobo ali svetlobo običajnih fluorescenčnih sijalk zagotavljajo učinkovito zaščito proti mikroorganizmom in so hkrati okolju prijazni. Obsevani nanomateriali preprečujejo prilepljanje mikrobov na površine. Titanatne antimikrobne prevleke so uporabne za najrazličnejše površine.

We have developed a solution for antimicrobial surface protection which provide continuous protection through illumination by sun light or widely spread fluorescence bulbs. Photo-induced stably-deposited titanate nanomaterials have been optimized to significantly inhibit antimicrobial activity and attachment at different surfaces. Titanate nanomaterials can be used on various kinds of surfaces.

- do 200-krat boljša protimikrobna zaščita kot jo ponuja sama UV svetloba
- okolju prijazna tehnologija
- ni potrebe po uporabi močnih detergentov ali antibiotikov
- zadostuje majhna količina materiala, kar pomeni, da je cena na m2 razmeroma nizka
- priprava nanopremazov je enostavna

- up to 200 times better protection than with UV light only
- environmental friendly technology
- no usage of strong detergents or antibiotics
- small amount of material, meaning that the price per m2 is relatively low
- nanocoating deposition methods are diverse and simple, can be post-processed on already finished surfaces of different chemical composition from metals to plastics



Protimikrobna površina (Foto: J. Štrancar, Odsek za fiziko trdne snovi)
Antimicrobial surface (Photo by J. Štrancar, Condensed Matter Physics).

Učinkovitejša zaščita pred sončnimi žarki

New formulation for highly effective sunscreen

TiO2, nanodelci, UV zaščita

nanoparticles, TiO2, UV filter, sunscreen

kozmetična industrija

suncare-cosmetics industry

KI, L10, Laboratorij za elektrokemijo materialov

NIC, L10, Laboratory for Materials Electrochemistry

PCT/EPO patentna prijava

PCT/EPO patent application

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Vedno močnejše sončno sevanje narekuje razvoj novih učinkovitejših sredstev za zaščito pred UV žarki.

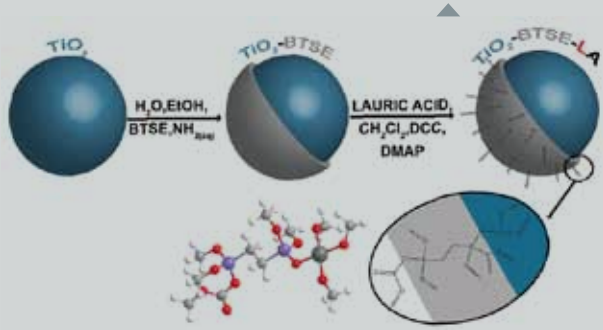
Always stronger sun radiation requires constant development of novel more efficient UV protection creams.

Razvili smo aktivne komponente za zaščito pred soncem, ki skoraj za red velikosti bolj učinkovito filtrirajo UV žarke kot obstoječi komercialni izdelki. Aktivna komponenta v naših sončnih kremah so hibridni nanodelci TiO_2 obloženi s silanolnimi skupinami, ki delujejo kot lovilci radikalov. Hibridni nanodelci omogočajo boljšo disperzibilnost v oljnih medijih in imajo tudi odlično dolgoročno stabilnost.

We have developed a new formulation of highly effective sunscreen with almost an order of magnitude better UV-filtering ability when compared to the existing commercial products. The new sunscreen is a composite of hybrid inorganic-organic coatings on TiO_2 nanocrystalline particles with increased dispersibility in organic vehicles and decreased formation of free radicals. The product solution is particularly appropriate for preparation of stable and effective sunscreens based on transparent oily media.

- red velikosti boljši UV filtri v primerjavi z obstoječimi komercialnimi izdelki
- visoka odpornost na vodo
- odlična stabilnost oljne suspenzije in učinkovitost UV filtriranja pri zelo nizkih koncentracijah
- zaradi zaščitne prevleke je izboljšana varnost v primerjavi z obstoječimi komercialno dostopnimi proizvodi

- an order of magnitude better UV-filtering ability if compared to the existing commercial products
- high water resistance
- supreme oil suspension stability and UV- filtering ability at extremely low concentrations
- improved safety due to the protective coating as compared to the existing commercially available products



Shematski prikaz sinteze nanodelcev za sončne kreme (Vir: M. Gaberšček, Laboratorij za elektrokemijo materialov)
Schematics showing the synthesis of nanoparticles (Source: M. Gaberšček, Laboratory for Materials Electrochemistry)

Bioaktivne prevleke za kostne vsadke

Multifunctional bioactive coating for bone implants

bioaktivno steklo, titanovi vsadki, nanotehnologija

bioactive glass, titanium implants

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bioaktivna prevleka za vse vrste kostnih vsadkov, industrija kostnih vsadkov in ortopedskih pripomočkov

bioactive coating for various types of bone implants

IJS, K7, Nanostrukturni materiali

JSI, K7, Nanostructured materials

PCT/EPO patentna prijava

PCT/EPO patent application

Umetni kostni vsadki izboljšajo gibalno sposobnost človeka s poškodovanim sklepom. Danes prednjačijo bioinertni vsadki iz titanove zlitine, ki jih organizem večinoma zgolj tolerira, zato se razmeroma počasi in omejeno zraščajo s kostjo.

Artificial bone implants improve motor skils of injured patients. The most frequently used bone implants are from titanium alloys which are bioinert but not bioactive and the osseointegration is relatively slow and frequently incomplete.

Razvili smo bioaktivno prevleko (bioaktivno steklo) za titanove vsadke, ki omogoča pospešeno vraščanje kostnega tkiva na titanove vsadke. Večslojna prevleka je sestavljena iz porozne titanove prevleke, vmesne prevleke iz titanovega oksida in prevleke iz bioaktivnega stekla. Večslojna prevleka je bioaktivna in ima tudi antibakterijske lastnosti. Prevleka iz bioaktivnega stekla omogoča bistveno izboljšano zraščanje kosti z vsadkom in je uporabna za različne vrste titanovih vsadkov v direktnem stiku s kostjo.

We have developed bioactive coating with bioactive glass for titanium bone implants that enhances osseointegration. The multilayer coating consists of a porous titanium layer, intermediate coating of titanium oxide and bioactive glass within the porous titanium layer. Multilayer coating is bioactive and also has antibacterial properties. Our bioactive glass coating provides significantly better bone ingrowing of bone into the implant and can be used for various types of titanium-based implants.

- bioaktivna prevleka omogoča oprijem celic na kostne vsadke
- hitro vraščanje kosti v vsadek
- antibakterijske lastnosti zmanjšajo možnosti okužb
- znižan nivo izločanja kovinskih ionov v telo

- bioactive properties enhance osseointegration
- antibacterial properties lower the probability of infection
- leaching of harmful metal ions is reduced

Shematski prikaz kostnega vsadka (Vir. S. Novak-Krmpotič, Nanostrukturni materiali)
Schematics of bone implant (Source. S. Novak-Krmpotič, Nanostructured materials)

Metoda za sintezo nanožic prehodnih kovin (molibden)

Method for synthesis of nanowires of trasition metals (molybdenum)

nanožice prehodnih kovin, nanoelektronika, molibden

nanowires of transition metals, molybdenum, nanoelectronics

visoko tehnološka industrija, nanoelektronika, prevodni kompoziti

high-tech industry, transparent electrode, nanoelectronics, conducting composites

IJS, Odsek za kompleksne snovi, F7, Odsek za anorgansko kemijo in tehnologijo K1, Nanocenter

JSI, Department of complex matter, F7, Department of Inorganic Chemistry and Technology, K1, Nanocenter

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Podeljen patent na tujem nacionalnem uradu

National patent granted at a foreign patent office

V visoko tehnološki industriji so prehodne kovine, vključno z molibdenom, zaradi svojih lastnosti, kot so npr. visoka temperaturna obstojnost in majhna temperaturna razteznost, zelo uporabne. Nanožice prehodnih kovin bi bile obetavne za uporabo predvsem v nanoelektroniki in za pripravo prevodnih kompozitov. Ena izmed glavnih omejitev za širšo uporabo nanožic prehodnih kovin (molibdena) je bilo pomanjkanje metod za njihovo sintezo v velikih količinah.

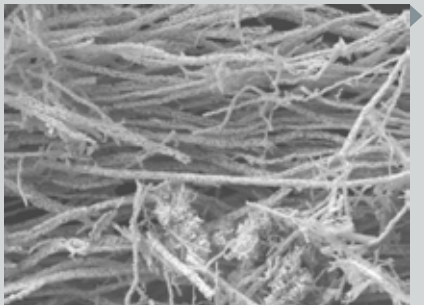
Transition metals are highly useful materials in technologicaly advanced industry due to their unique features like high temperature stability and low temperature expansion coeficient. Transition metalwires are promising for the broad usage in nanoelectronics and preparation of conductive composites. So far the limitation of broader usage of nanowires of transition metals was absence of large scale synthesis.

Razvili smo enostopenjski postopek za sintezo velikih količin nanožic prehodnih kovin (molibdena) s segrevanjem kvazienodimenzionalnih struktur na osnovi prehodnih kovin v prisotnosti vodika. Tako pripravljene nanožice bi bile uporabne v visokotehnološki industriji predvsem za transparentne elektrode in za pripravo prevodnih polimerov.

We have developed a method for a large scale production of nanowires of transition metals (molybdenum). The synthesis proceeds by the chemical transformation of quasi one dimensional compounds based on transition metals during the heating in the presence of hydrogen. Obtained nanowires are applicable in the high-tech industry, especially in nanoelectronics as transparent electrodes and for the preparation of conducting polymers.

- sinteza nanožic prehodnih kovin (npr. molibdena) v velikem obsegu

- for the first time the posibility of large scale synthesis of transition metals nanowires (molybdenum)



Nanožice iz molibdena (Foto A. Kovič, Odsek za kompleksne snovi)
Molybdenum nanowires (Photo A. Kovič, Department of complex matter)

Postopek za pripravo aktivnih kompozitnih elektrod za litijeve ionske akumulatorje

The process for preparation of active electrode composites for lithium-ion batteries

litijeve ionske baterije, nanodelci, kompozitne elektrode

lithium-ion batteries, nanoparticles, composite electrodes

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industrija litijevih ionskih akumulatorjev

battery industry

KI, L10, Laboratorij za elektrokemijo materialov

NIC, L10, Laboratory for Materials Electrochemistry

PCT/EPO patentna prijava

PCT/EPO patent application

Trenutno predstavljajo litijevi ionski akumulatorji najbolj učinkovit način za shranjevanje kemične kemijske energije. Večina dostopnih metod za sintezo insercijskih aktivnih spojin, gradnikov litijevih ionskih akumulatorjev, ne omogoča istočasne priprave spojin s kontrolirano elektronsko in ionsko prevodnostjo in hkrati omogoča nadzor velikosti in porazdelitve aktivnih delcev.

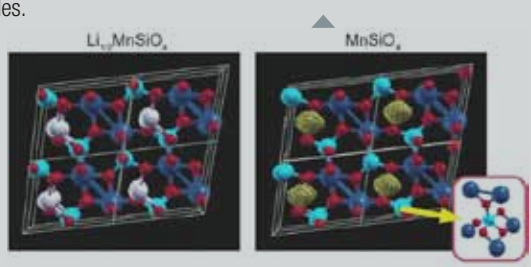
Lithium-ion batteries are currently the most efficient way of storing the chemical energy. Most of the available methods for the synthesis of insertion of the active compounds, the building blocks of lithium ion batteries, does not allow simultaneous preparation of compounds with controlled electronic and ionic conductivity, and at the same time to control the size and distribution of active particles.

Razvili smo postopek dvostopenjske sinteze kompozitov za litijeve ionske akumulatorje, ki omogoča pripravo aktivnih snovi z nizko elektronsko prevodnostjo in hkrati omogoča nadzor nad velikostjo pripravljenih delcev ter dobro elektronsko ožičenost. V prvi stopnji po sol-gel postopku pripravimo nanodelce v porozni matriki ogljikovega filma. V drugi stopnji tako pripravljenemu kompozitu dodamo litijeve ione. Pripravljeni homogeni elektrodni kompoziti omogočajo boljše delovanje litijevih ionskih akumulatorjev.

We have developed two step synthesis for preparation of composites for lithium-ion batteries. In the first step homogeneously distributed precursor in a porous carbon matrix is synthesized and it is enriched with the lithium in the second step. The obtained homogeneous electrode composites provide better functioning of a lithium-ion battery. The method is applicable for the industry of lithium-ion batteries.

- dvostopenjska sinteza omogoča pripravo homogenih kompozitnih elektrod za litijeve ionske akumulatorje in s tem izboljša delovanje litijevih ionskih akumulatorjev,
- rezultat sinteze so kristalografsko čisti, enako veliki delci insercijskih aktivnih spojin za litijeve ionske akumulatorje.

- The two step synthesis provides the preparation of homogeneous electrode composites and thus improve the performance of a lithium-ion battery.
- The synthesized insertion active compounds are crystallographically pure with equally sized particles.



Shematski prikaz kemijskih struktur v litijevih baterijah (vir: M. Bele, Laboratorij za elektrokemijo materialov)

Scheme of chemical structure in lithium batteries. (Source: M. Bele, Laboratory for Materials Electrochemistry)

Uporaba magnetnih nanodelcev v biomedicini

Application of magnetic nanoparticles in biomedicine

nanotehnologija, magnetni nanodelci

nanotechnology

biomedicinske raziskave, dostavni sistemi za zdravila, slikanje tumorjev z magnetno resonanco, proizvodnja zdravil, elektronika

biomedical research, drug delivery systems, magnetic resonance tumour imaging, biochemistry and medical applications, drug production, electronics

IJS, K8, Odsek za sintezo materialov

JSI, K8, Department for the Synthesis of Materials

Skrivno znanje

Secret know-how

Razvili smo postopek za pripravo magnetnih nanodelcev, na katere lahko kontrolirano vežemo različne molekule in pripravimo unikatne nanodelce. Po želji naročnika lahko kontrolirano vežemo želene molekule na osnovne magnetne nanodelce v točno določenih razmerjih.

We offer on-demand development and delivery of specialized custom-made multifunctional magnetic nanoparticles with precisely defined ratios between bonded molecules by costumer request. Potential customers are researchers working on drug delivery systems. The main advantage of the method is a specially designed surface area that enables simple preparation of multifunctional nanoparticles.

- Glavna prednost naših osnovnih nanodelcev pred konkurenco je specialno obdelana površina, ki omogoča enostavno pripravo večnamenskih nanodelcev.

- The main advantage of nanoparticles platform is a specially designed surface area that enables simple and custom-made preparation of multifunctional nanoparticles.

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Adhezijska prevleka za keramične zobnoprotetične izdelke

Adhesion coatings for ceramic dental restorations

adhezijska prevleka, zobna protetika, keramika

adhesion coating, fixed partial dentures, sintered ceramics

podjetja, ki izdelujejo materiale in pripomočke za zobnoprotetične laboratorije

manufacturers of materials and equipment for dental laboratories

IJS, Inženirska keramika, K6

JSI, Engineering Ceramics K6

Podeljen patent na tujem nacionalnem uradu

National patent granted at a foreign patent office

Ena od pomanjkljivosti keramičnih ogrodnih materialov, ki se v zadnjem času vedno pogosteje uporabljajo v fiksni zobni protetiki, je slab oprijem z zobnimi cementi.

Recently, sintered ceramics are increasingly used as core materials for the production of all-ceramic dental restorations. One of the disadvantages of using ceramic cores for prosthetic crowns and bridges is weak bonding of dental cements to the surface of ceramics.

Razvili smo enostaven postopek nanosa nanostrukturne adhezijske prevleke iz aluminijevega oksida na keramične zobnoprotetične izdelke. Postopek temelji na hidrolizi aluminijevega nitrida (AlN) v aluminijev hidroksid in naknadni toplotni obdelavi. Keramični zobnoprotetični izdelek potopimo v vodno suspenzijo aluminijevega nitrida, pri čemer pride do tvorbe tanke prevleke z veliko specifično površino. Adhezijsko prevleko je mogoče nanesti na različne dentalne materiale. Adhezijska prevleka omogoča boljšo adhezijo z zobnimi cementi in posledično višjo kvaliteto zobnoprotetičnih izdelkov.

We have developed a simple process for applying an adhesion coating to fixed partial dentures or abutments of dental implants. The coating exhibiting high surface area is formed by submersion of ceramic dental restorations into an aqueous aluminium nitride (AlN) suspension and subsequent thermal treatment. The coating significantly improves the adhesion of dental luting agents to the surface of zirconia and alumina ceramics. Consequently, the bonding is stronger and more durable also providing better quality of dental prosthetics.

- izrazito povečanje trajnosti in trdnosti spoja med dentalnim cementom in keramičnim ogrodnim materialom
- povečana odpornost proti termičnim spremembam v ustni votlini
- nanos je uporaben za različne vrste cementov in keramičnih ogrodnih materialov

- significantly improved adhesion of common dental luting agents to ceramic dental restorations
- increased resistance to de-bonding caused by mechanical and thermal cycling in the oral cavity
- applicable for many different types of dental cements and ceramic core materials

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Površina zobne nadgradnje (vir: K. Krnel, Inženirska keramika)
Surface of dental restoration (Source: K. Krnel, Engineering Ceramics)

Nov pristop za dosego učinkovitega antibakterijskega delovanje z aktivnim zlatom

A novel approach for reaching highly effective antibacterial action using activated gold

antibakterijski kompoziti, nanodelci zlata, funkcionalizacija zlata, biokeramika

antibacterial composites, gold nanoparticles, functionalization of gold, bioceramics

ortopedija, zobozdravstvo, plastična kirurgija, antibakterijska zaščita sanitetnih materialov, kozmetična industrija (zobne paste, ustna voda, tekoča mila, geli za tuširanje)

implants formation in orthopedics, dentistry, plastic surgery, for antibacterial protection in first-aid material, in cosmetics for hygiene (tooth pastes, mouthwash liquid, soaps, shower gels),

IJS, K9, Raziskave sodobnih materialov

JSI, K9, Advanced Materials

Slovenska patentna prijava

Slovenian patent application

Srebro je kovina z najmočnejšim antibakterijskim delovanjem proti različnim vrstam bakterij in ostalim patogenom. Slaba lastnost koloidnega in nano srebra je neselektivnost, kar pomeni da ima enak vpliv do patogenov, kot do ostalih celic. Posledično je škodljivo za zdravje ljudi.

Silver is the strongest antibacterial material effective against different bacteria and other pathogens. The lack of the colloidal and nano silver is an absence of selectivity, meaning that it influences to all cells in the same manner resulting in their death. Consequently, it is harmful for human health.

Razvili smo nov pristop za dosego zelo učinkovite antibakterijske zaščite s pomočjo uporabe aktivnega zlata. Z ustrezno sintezno metodo smo pripravili nano kompozite na osnovi biokeramike hidroksiapatita s pričvrščenimi nano delci zlata, ki so bili površinsko funkconalizirani z izbranimi organskimi spojinami, ki jih najdemo v naravi. Nobena od teh treh komponent ni toksična in ne izkazuje antibakterijskih lastnosti. Šele njihova prava kombinacija, kot tudi velikost nano delcev omogoči, da ima tak material zelo izražene antibakterijske lastnosti in ni strupen za človeka in okolje.

We have developed a novel approach for reaching highly effective antibacterial action by using active gold. Using suitable preparation method we have prepared nanocomposite based on bioceramic hydroxyapatite with attached gold nanoparticles that are additionally functionalized by selected, natural organic molecules. Neither of these three components are toxic and do not exhibit antibacterial properties. The proper combination of these three components as well as the morphology of nanoparticles results in material with enhanced antibacterial properties that is also non-harmful for human and environment.

- bakterije ne razvijajo odpornosti na nov antibakterijski material na osnovi zlata, kot je to v primeru antibiotikov
- nov material na osnovi zlata ni strupen za ljudi
- nov antibakterijski material na osnovi zlata omogoča dvakrat višjo učinkovitost antibakterijske zaščite v primerjavi s komercialnim srebrom
- nov antibakterijski material na osnovi zlata je okolju prijazen material
- sintezna metoda, ki smo jo razvili za sintezo novega materiala je enostavna in spada v področje zelene kemije

- bacterial do not develop resistivity to novel gold based material as they do to antibiotics
- novel material based on gold is not toxic to human
- novel antibacterial material based on gold provides at least twice as effective against bacteria compared to the same composites with a silver component
- novel material based on gold is environmentally friendly
- synthesis method developed for formation of novel material is simple and belongs to green chemistry

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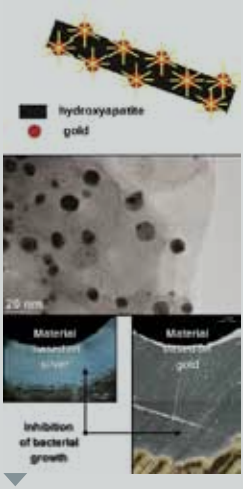

Shema strukture novega materiala na osnovi zlata, mikroskopski posnetek sintetiziranih nanodelcev ter prikaz primerjave antibakterijskih lastnosti novega materiala z zlatom in materiala s srebrom.
Schematic presentation of the structure of novel gold based material, microscopic presentation of synthesized nanoparticles and presentation of the comparison of antibacterial properties of novel gold based material and material with silver.

Uporaba odpadnega prahu v bitumenskih vezivih

Utilization of waste powder for asphalt binder modifier

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vezivo za asfalt, modifikator bitumna, bitumen, vezivo	bitumen binder modifier, asphalt, pavement
gradbeništvo, asfalterstvo	**pavement construction, construction industry**
KI, L03, Laboratorij za kemometrijo	NIC, L03, Laboratory of Chemometrics
Slovenska patentna prijava	Slovenian patent application

V gradbeni industriji je prisotno konstantno povpraševanje po boljših in cenejših materialih. Trenutno so v uporabi na bolj obremenjenih cestah s SBS modificirana bitumenska veziva, ki so draga in postopek priprave asfalta in vgradnje asfalta zahtevnejši kot z običajnimi cestogradbenimi bitumni.

In the pavement construction industry, there is continues demand for better and cheaper materials. Currently used SBS modified bitumen binders are expensive. Procedures of asphalt production and building in asphalt layer are more demanding than with ordinary paving grade bitumen.

Razvili smo nov modifikator za asfaltna veziva, ki povečuje trajnost asfaltu. Kot dodatek bitumnu smo uporabili odpadni prah PMMA / ATH. Dodajanje PMMA / ATH bitumnu poveča trajnost asfalta in odpornost asfaltnih plasti na tvorbo kolesnic. Naš modifikator bitumna je uporaben v asfalterstvu in gradbeni industriji.

We have developed a new binder modifier that increases the durability of the asphalt. PMMA/ATH waste powder is used for bitumen modification. Addition of PMMA/ATH material increases the durability of the asphalt concrete and increases the resistance to the rut formation. The bitumen modifier is useful in the road construction industry.

- cenejši material od trenutno uporabljenega SBS dodatka bitumnu
- hitrejša priprava asfalta kot z vezivom SBS
- ni potrebe po povišani temperaturi mešanja, kar je značilno za vezivo SBS
- 3-krat večja odpornost asfalta na tvorbo kolesnic, kot brez veziva
- nestrupeno in kemijsko inertno vezivo, zato okolju prijazno

- cheaper material than currently used SBS bitumen binders
- faster preparation of asphalt than with currently used SBS binders
- no need for increased temperature of mixing as it is for SBS binders
- 3 times higher resistance of the asphalt to the rut formation as without the binder
- non-toxic and chemically inert binder, thus environmentally friendly

Priprava asfaltne zmesi (Vir: M. Tušar, Laboratorij za kemometrijo)
Preparation of asphalt with the waste powder (Source: M. Tušar, Laboratory of Chemometrics)

Gen za pospeševanje primarnega metabolizma

Mutated truncated mt-pfkA gene for acceleration of the primary metabolism

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pfkA gen, biosinteza, pospešen primarni metabolizem

pfkA gene, biosynthesis, enhanced primary metabolism

biotehnologija

biotechnology

KI, L12, Laboratorij za biotehnologijo

NIC, L12, Laboratory of biotechnology

Podeljen patent na tujem nacionalnem uradu

National patent granted at a foreign patent office

Pri biotehnološki proizvodnji aktivnih spojin igra hitrost sinteze produkta pomembno vlogo pri določitvi končne cene produkta. Pri izboljšavah biotehnoloških procesov zato vedno stremimo k bolj učinkovitim mikroorganizmom, tako da v čim krajšem času predelajo čim več substrata v končni produkt.

In biotechnological production of active compounds the rate of product formation plays an important role in the final price of the product. Thus, the improvements of biotechnological processes always strive to improve the microorganism so that the substrate is more rapidly porcessed to the final product.

Pripravili smo spremenjen gen za encim 6-fosfofrukto-1-kinazo (mt-pfkA gen), ki v izvorni obliki prestavlja ključni regulatorni encim enega dela primarnega metabolizma. Mikroorganizmi z vgrajenim mt-pfkA genom imajo izboljšano produktivnost in bistveno večji izkoristek biosinteznih poti. Produkt mt-pfkA gena v rekombinantnih mikroorganizmih poveča hitrost sinteze celične biomase, pospeši izločanje zunajceličnih encimov in hkrati poveča produktivnost primarnih in sekundarnih metabolitov. Tehnologija je uporabna za različne biotehnološke seve bakterij, gliv in kvasovk.

We have developed a gene for modified 6-phosphofructo-1-kinase (mt-pfkA gene), the enzyme which acts as a key regulatory enzyme of glycolytic flux. Modified mt-pfkA gene increases the productivity and yields of various commercial micro-organisms after the insertion the product of mt-pfkA gene enhances the rate of cell biomass synthesis, excretion of extracellular enzymes and increases the productivity of primary and secondary metabolites. The technology is applicable with various bacterial, fungal and yeast strains used for large-scale bio-manufacturing, using both chemically defined and nutritionally complex media.

- pospešena sinteza celične biomase
- povečano izločanje zunajceličnih encimov
- povečana produktivnost primarnih in sekundarnih metabolitov

- enhanced rate of cell biomass synthesis
- enhanced excretion of extracellular enzymes
- increased productivity of primary and secondary metabolites

Priprava industrijskih sevov kvasovk novih generacij

Design of New Generation Strains of Industrial Yeast

sevi kvasovk, biotehnologija	yeast strains, biotechnology
kvasni biotehnološki postopki (vključno s proizvodnjo biogoriv, piva, vina, kruha, posebnih kemikalij)	**yeast-based biotechnology processes (including biofuel production, beer, wine and bread making, special chemicals production and yeast cell factory applications)**
IJS, B2, Molekularne in biomedicinske znanosti	JSI, B2, Molecular and Biochemical Sciences
Skrivno znanje	Secret know-how

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Obstaja vse večje povpraševanje po razvoju novih, učinkovitejših industrijskih sevov kvasovk.

There is a growing demand for the development of new and more efficient industrial yeast strains.

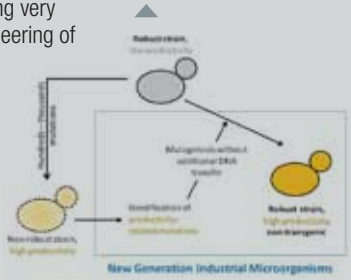
Razvili smo novo metodo za pridobivanje boljših industrijskih sevov kvasovk, ki omogoča znižanje stroškov in povečano učinkovitost biotehnoloških procesov s kvasovkami. Pri naši metodi najprej z genetsko analizo natančno identificiramo posamezne genetske elemente, ki pozitivno oziroma negativno vplivajo na želeno lastnost. Tako identificirane genetske elemente pa nato združene prenesemo v novo nastali sev kvasovk, ki omogoča bolj učinkovito biotehnološko proizvodnjo.

We have developed a new method for the generation of improved industrial yeast strains that would allow decreased costs and increased efficiency of yeast-based biotechnology processes. We perform genetic analysis for accurate identification of specific genetic elements with positive and negative impact on the desired characteristic, and transfer the combined genetic elements into thus generated novel yeast strains.

- znižanje stroškov biotehnološke proizvodnje s kvasovkami
- povečana učinkovitost biotehnološke proizvodnje s kvasovkami
- ni neželenih učinkov genetskih elementov, ki bi lahko zniževali biotehnološko produkcijo
- natančna karakterizacija genetskih elementov, kar omogoča natančno izdelavo novih sevov kvasovk za biotehnološko proizvodnjo

- decreased cost of yeast based biotechnological production
- increased efficiency of yeast based biotechnological production
- no limitation by inhibitory genetic elements that could hinder the productivity or robustness of the industrial yeast strain
- for the first time, the respective genetic elements can be characterized down to single gene level and often even single nucleotide variation level, enabling very precisely designed genetic engineering of novel strains

Priprava industrijskih sevov kvasovk novih generacij (Vir: U. Petrovič, Odsek za molekularne in biomedicinske znanosti)
Design of New Generation Strains of Industrial Yeast (Source: U. Petrovič, Molecular and Biochemical Sciences)



Gensko spremenjene mlečnokislinske bakterije za zdravljenje kroničnih vnetnih črevesnih bolezni

Modified food grade microorganism for treatment of inflammatory bowel disease

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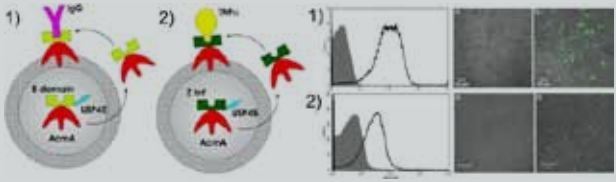
mlečnokislinske bakterije, TNF-α, kronična vnetna črevesna bolezen	lactic acid bacterium, TNF-α, inflammatory bowel disease
farmacija, biotehnologija, zdravljenje kronične vnetne črevesne bolezni (Chronove bolezni, ulcerativnega kolitisa)	**pharmacy, biotechnology, treatment of inflammatory bowel diseases including Chron's disease and ulcerative colitis.**
IJS, B3, Biotehnologija	JSI, B3, Biotechnology
PCT/EPO patentna prijava	PCT/EPO patent application
Zdravljenje vnetnih črevesnih bolezni z monoklonskimi protitelesi je zelo drago.	Treatment of inflammatory bowel disease.
Pripravili smo rekombinantne mlečnokislinske bakterije, ki na površini izražajo vezavni peptid za citokin TNF-α. Rekombinantne mlečnokislinske bakterije vežejo in odstranijo odvečni citokin iz črevesja. Rekombinantne mlečnokislinske bakterije se lahko uporabljajo za zdravljenje kronične vnetne črevesne bolezni (Chronove bolezni in ulceroznega kolitisa).	We have developed innovative recombinant lactic acid bacteria that express cytokine TNF-α-binding peptides on their surface. Recombinant bacteria bind and eliminate redundant cytokine from the gut and do not influence other organs. Such microorganisms can be used for treatment of inflammatory bowel diseases including Chron's disease and Ulcerative colitis.
• bistveno nižji stroški proizvodnje v primerjavi s proizvodnjo monoklonskih protiteles • hitra uvedba v proizvodnjo • ne pričakuje se stranskih učinkov zdravljenja • pacientom prijazna oblika aplikacije zdravila	• significantly lower production costs compared to monoclonal antibodies • rapid introduction into the production • no expected side effects • patient friendly administration



Shematski prikaz laktokokov s TNFα vezavnim peptidom in mikroskopska slika flurescenčno označenih celic, ki izražajo TNFα vezavni peptid (Vir: Odsek za biotehnologijo)
Schematic representation and picture of flurescently marked TNFα expressing cells. (Source: Department of Biotechnology)

Razvoj hibridnih sort hermafroditnih rastlin z uporabo kemijskih hibridnih sredstev

Development of superior varieties of hermaphrodite plants with chemical hybridizing agent based on natural compound

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hermafroditne rastline, pšenica (Triticum aestivum L.), kemična hibridna sredstva, hibridne sorte, hibridizacija

hermaphrodite plants, wheat (Triticum aestivum L.), chemical hybridizing agents, hybridization hybrid varieties, seeds

priprava hibridnih semen za različne kmetijsko uporabne sorte, semenarske hiše

production of hybrid seeds of various agricultural plants

IJS, K3, Fizikalna in organska kemija

JSI, K3, Physical and Organic Chemistry

PCT/EPO patentna prijava

PCT/EPO patent application

Razvoj hibridnih sort s pomočjo sredstev za kemično hibridizacijo je zelo učinkovit. Žal so kemična sredstva za hibridizacijo, ki so trenutno v uporabi, strupena in kancerogena.

Development of hybrid varieties with chemical hybridizing agents is very effective. Unfortunately, chemical hybridizing agents are toxic and carcinogenic.

Razvili smo postopek za sintezo okolju prijaznega sredstva za kemično hibridizacijo, ki omogoča razširitev in pocenitev proizvodnje hibridnega semena navadne pšenice. Sredstvo za kemično hibridizacijo je osnovano na naravni spojini, ki jo je mogoče modificirati v druge oblike vodotopnih sredstev primernih za uporabo na polju. Kemično hibridno sredstvo je uporabno za vse vrste pšenic in drugih kmetijsko uporabnih rastlin.

We have developed a process for the synthesis of environmentally friendly chemical hybridizing agent, which enables cheaper production of hybrid seeds. Our chemical hybridizing agent is based on natural compound and can be modified to other water soluble materials suitable for use in the field. Our chemical hybridizing agent can be used for all types of wheat and other agricultural plants.

- okolju prijazno hibridno sredstvo
- enostaven in ekonomičen postopek priprave kemičnega hibridnega sredstva
- bolj učinkovito opraševanje
- večji delež pridelanih hibridnih semen

- environmentally friendly chemical hybridizing agent
- simple and economically favorable synthesis based on natural compound
- better pollination
- greater quantity of seeds of the desired F1 generation

Testiranje derivatov oksalne kisline na polju (Vir: J. Iskra, Fizikalna in organska kemija)
Testing of oxalic acid derivates in the field (Source: J. Iskra, Physical and Organic Chemistry)

Izboljšana sinteza produkta biosinteze z usmerjenim sestavljanjem biosintetskih encimov na motivu nukleotidnega zaporedja

DNA-guided assembly platform for efficient production of biosynthetic compounds

sintezna biologija, DNA usmerjevalnik, biosinteza

synthetic biology, DNA assembly platform, biosynthesis

biotehnologija, farmacevtska industrija, proizvodnja biogoriv

biotechnology, pharmacy, industry of biofuels

KI, L12, Laboratorij za biotehnologijo

NIC, L12, Laboratory of Biotechnology

PCT/EPO patentna prijava

PCT/EPO patent application

Trenutno je najpomembnejša metoda za povečevanje biotohnološke proizvodnje bioakivnih snovi, izboljšava sevov z naključno mutagenezo, ki vodi do sinteze večje količine encimov v celici in posledično večje količine bioproduktov. Metoda ima svoje omejitve in potrebni so novi drugačni pristopi za izboljšanje bioproizvodnje.

Currently, the main method to increase the biotechnological production of biocompunds is strain improvement by random mutagenesis which results in increased amounts of the key enzymes inside the producing microorganism. However this method has limitations and novel approaches to increase the bioproduction of compounds are needed.

Razvili smo metodo za izboljšanje izkoristkov biosintetskih procesov z usmerjenim sestavljanjem biosintetskih encimov na motivu nukleotidnega zaporedja. Bistvo našega izuma je orodje za inženiring biosintentskih poti s pomočjo ogrodja. Gostiteljske celice smo gensko spremenili tako, da proizvajajo encime biosintetske poti, od katerih je vsak posebej vezan na DNA vezavni protein hkrati pa smo vstavili programsko zaporedje nukleinske kisline, ki vsebuje izbrano zaporedje tarč za omenjene DNA vezavne proteine. Encimi z DNA vezavno domeno se vežejo na nukleinsko kislino, ki usmerja proteine v multiproteinski kompleks in služi ureditvi encimov biosintetske poti vzdolž programskega zaporedja nukleinskih kislin. Z lokalizacijo encimov bioprocesne poti v multiproteinski proces dosežemo močno povečan izkoristek biosinteze.

We have developed a DNA-guided assembly platform that provides powerful tool for engineering of biosynthetic pathways. The core of the invention is a method of producing a compound by biosynthetic pathway based on the DNA scaffold. Host cells are genetically modified to express biosynthetic enzymes whereas each of them is linked to a different nucleic acid binding protein domain and addition of a nucleic acid sequence comprising the selected order of motifs for said DNA binding proteins which directs biosynthetic enzymes into a defined multi protein complex. Functional biosynthetic enzymes fused with DNA-binding domains bind to DNA motifs allowing functional enzymes to arrange along the DNA in a defined order. This highly increases the yield of biosynthesis of a desired product. The method is applicable for the synthesis of biocompounds.

- znižanje stroškov proizvodnje
- velik izkoristek biosintezne poti (6 krat večji izkoristek sinteze violaceina)
- ni težav pri pravilnem zvitju ogrodnih proteinov
- uporabno za biosintetske poti s 3 - 100 sintetskimi koraki

- reduction of production costs
- high productivity of biosynthesis (6 times higher yield of synthesis of violacein)
- no protein scaffold maturation problem
- applicable for the enhanced biosynthesis of bioreactions with 3 to 100 steps

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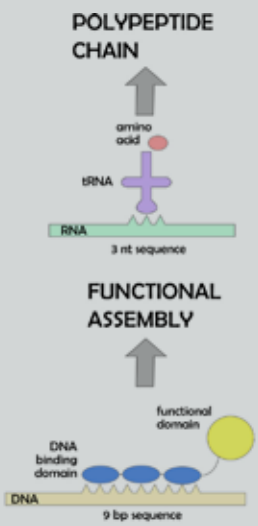

Shematski prikaz usmerjene biosintetske poti (Vir: Laboratorij za biotehnologijo, KI)
DNA-guided assembly platform. (Source: Laboratory of Biotechnology)

Contextify - pomoč pri iskanju po elektronski pošti

Contextify - bringing the semantic web to emails

elektronska pošta, uvažanje elektronske pošte, iskanje po elektronski pošti

e-mail, inbox search, importing e-mails

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iskanje po elektronski pošti

managing emails (add-in for Microsoft Outlook)

IJS, E3, Umetna inteligenca

JSI, E3, Artificial intelligence

Skrivno znanje

Secret know-how

Za aktivne uporabnike e-pošte je lahko iskanje po e-poštnem nabiralniku s tisočimi e-poštnimi sporočili zahtevna naloga.

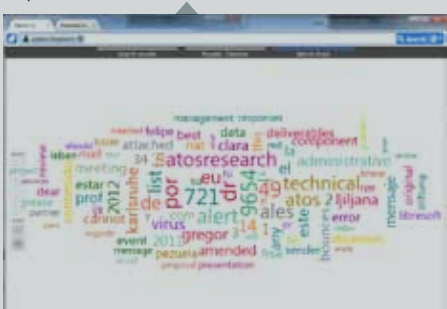
Finding an email or a group of emails in an inbox containing thousands of emails can be a challenging task for active email users.

Razvili smo platformo ("Contextify"), ki omogoča posameznikom in organizacijam uvažanje e-pošte iz enega ali več e-poštnih računov. Napredne funkcije iskanja omogočajo iskanje po različnih informacijah. Rezultati iskanja niso le našteti, ampak tudi prikazani v obliki socialnih mrež in časovnih oblakov. Platforma je uporabna za posameznike in podjetja. Contextify je dodatek za Microsoft Outlook, ki vam lahko pomaga iskati, upravljati in označevati elektronska sporočila in kontakte.

We have developed a platform ("Contextify") that allows individuals and organizations to import emails from one or more email accounts. Advanced search features can be used to find relevant information. The search results are not only listed but also visualized using social network, timeline and tag cloud. The service can be used on personal and enterprise level to quickly find and display information. Contextify is an add-in for Microsoft Outlook that can help to search, manage and tag emails and contacts.

- možno je iskanje po imenih, skupinah, oznakah, času
- rezultati iskanj so vizualizirani in povzeti na različne načine
- interaktivna vizualizacija podatkov
- iskanje podatkov se lahko samodejno izvaja na strežniku, medtem ko lahko uporabnik išče po e-pošti

- search is not based only on keywords but features such as people names, groups, tags and time
- the results are also summarized and visualized in different ways.
- summaries of results include social network visualization, timeline visualization and a tag cloud.
- all visualizations are interactive
- the application can be configured to work in the cloud and the data importing can be automatically performed on the server side, while one or more clients can perform the search



Prikaz podatkovnega oblaka (Vir: G. Leban, Umetna inteligenca)
Tag cloud (Source: G. Leban, Artificial intelligence)

Odkrivanje strukture v nestrukturiranih podatkih (OntoGen)

Discovering structure in unstructured data (OntoGen)

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podatkovno rudarjenje, sistem za ontologijo, kategorizacija podatkov

text mining, ontology system, categorization of data

velika podjetja, ki potrebujejo pomoč pri analiziranju vsebine velike količine podatkov

big enterprises that require help with understanding content within their corpora

IJS, E3, Laboratorij za umetno inteligenco

JSI, E3, Artificial intelligence laboratory

Skrivno znanje

Secret know-how

V sodobnih podjetjih je večina podatkov shranjena v nestrukturirani obliki, kar otežuje hitro pridobivanje informacij znotraj podjetja.

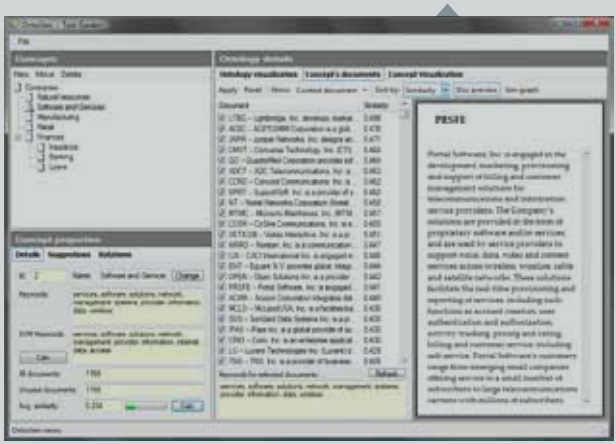
Most data in a modern enterprise are stored in unstructured form that from which the information about the organisation is hard to be retrieved.

Razvili smo polavtomatski sistem za gradnjo ontologij podatkov, ki omogoča lažje in hitrejše razumevanje vsebine velike količine podatkov in tudi organizacijo nestrukturiranih podatkov. Naš sistem omogoča uporabniku prijazno in hitro rudarjenje podatkov, saj vsebuje enostaven vmesnik. Brezplačno dostopna različica programa (http://ontogen.ijs.si/) je bila že velikokrat preizkušena in se uporablja v številnih znanih podjetjih kot so: New York Times, Bloomberg, Honda, Microsoft, Siemens in Fiat.

We have developed a semi-automatic and data-driven ontology system for easier and faster understanding and organization of unstructured data. Our system combines text-mining techniques with an efficient user interface that reduces complexity and time spent for user. The program has already been tested in several real-world scenarios. Our freely available version (http://ontogen.ijs.si/) has been adopted for specific scenarios of several companies that are using it including New York Times, Bloomberg, Honda, Microsoft, Siemens and FIAT.

- sistem združuje podatkovno rudarjenje s kompleksnimi operacijami kot so kategorizacija in povzemanje vsebine podatkov, hkrati pa je uporabniku prijazen
- sistem je enostavno vključiti v obstoječe programsko okolje

- it integrates text mining technology and complex tasks such as summarization and categorization with a user friendly interface
- the product can be easily integrated with the existing infrastructure



Prikaz rezultatov iskanja (Vir: B. Fortuna, Laboratorij za umetno inteligenco)
Search results (Source: B. Fortuna, Artificial intelligence laboratory)

Osebna kuhinjska tehtnica za podporo prehranski obravnavi bolnikov v bolnišničnem in domačem okolju

Smart kitchen scale for people with special nutritional needs

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pametna kuhinjska tehtnica, podatki o vsebnosti hranilnih snovi

smart kitchen scale, data on the nutrient content

šole, vrtci, bolnice, diabetiki, ledvični bolniki, bolniki s putiko, bolniki z visokim krvnim tlakom

schools, kindergartens, hospitals, diabetics, renal patients, patients with gout, patients with high blood pressure

IJS, E7, Računalniški sistemi

JSI, E7, Computer Systems

Podeljen slovenski patent

Slovenian patent granted

Ljudje s posebnimi prehranskimi potrebami se srečujejo s težavo, kako določiti vsebnost posameznih hranil in količino zaužitih hranil, npr. sladkorja v zaužiti hrani.

People with special dietary needs are faced with the problem of how to determine the individual nutritional values and nutrition intakes, for example sugar in the diet.

Razvili smo pametno brezžično žepno kuhinjsko tehtnico za pomoč ljudem s posebnimi prehranskimi potrebami. Glavna prednost kuhinjske tehtnice je, da jo uporabnik lahko prilagodi svojim potrebam. Kuhinjska tehtnica vsebuje orodje za analiziranje sestave hrane in pomaga pri sestavljanju uravnoteženih obrokov. Pametna tehtnica lahko določi sestavo hrane v že poznanih obrokih, lahko pa jo prilagodimo za določanje sestave še nepoznanim jedem. Prototip pametna kuhinjske tehtnice je že na voljo v obliki pametnega telefona.

We have developed a lite, pocket-sized, wireless kitchen scale that is used for assisting people with special nutritional needs by analyzing the content of any food portions. The main advantage of the scale is that it is smart and adaptable to personal needs. Kitchen scales contains tools for analyzing the composition of food and assists to plan well-balanced meal. A prototype in a form of a smartphone has been developed and it can be used in hospitals and elderly homes.

- prenosna in brezžična tehtnica
- omogoča analizo vseh vrst hrane, tudi takšne za katere ne poznamo recepta
- poleg hranilnih vrednosti, pametna tehtnica lahko vsebuje podatke o vsebnosti škodljivih snovi, ali E-jev

- it is portable, wireless and enables weighing of realistic food portions
- smart kitchen scale determines the composition of already known food and it can be adjusted to determine the composition of yet unknown dishes
- besides energy and food composition, it can also provide data about additives and toxic substances

Prenosna žepna kuhinjska tehntnica. (Foto: B. Koroušić-Seljak, Odsek za računalniške sisteme)
Pocket-size wireless kitchen scale. (Photo: B. Koroušić-Seljak, Department for Computer Systems)

Uporaba utekočinjenega lesa za lepila

Wood adhesives made out of liquified wood

utekočinjen les, predelava lesne biomase, okolju prijazna lepila, vezane plošče

liquified wood, biomass processing, environmentally friendly adhesives, plywood

lepilo za iverne in vezalne plošče, pohištvena industrija, industrija lesnih proizvodov

wood adhesives, furniture industry, wood products

KI, L07, Laboratorij za polimerno kemijo in tehnologijo

NIC, L07, Laboratory for Polymer chemistry and Technology

Podeljen slovenski patent

Slovenian patent granted

Lesna biomasa predstavlja obetaven vir obnovljivih surovin za proizvodnjo polimernih materialov in še posebej v Sloveniji ni dovolj učinkovito uporabljena. Trenutno dostopna lepila za iverne plošče niso okolju in zdravju prijazna, saj pri utrjevanju emitirajo veliko zdravju škodljivega formaldehida.

Wood biomass represents a promising source of renewable materials for the manufacturing of polymeric materials. Currently available adhesive for plywood are neither environmentally friendly nor healthy, since they contain large proportion of toxic formaldehyde.

Razvili smo postopek za utekočinjene lesne biomase, ki predstavlja veliko perspektivo za učinkovito izrabo lesne biomase. Pri tem postopku s pomočjo glikolov in kislinskih katalizatorjev pri povišani temperaturi dosežemo utekočinjenje lesa. Utekočinjenemu lesu dodamo melaminsko-formaldehidne ali melaminsko-urea-formaldehidne smole in tako dobimo lepilo za iverne plošče, v katerem nadomestimo del surovin sicer pridobljenih iz surove nafte z lesno biomaso. Lepilo iz utekočinjenega lesa ima enake ali še boljše vezavne lastnosti kot do sedaj komercialno dostopna lepila. Velika prednost lepila iz utekočinjenega lesa je nižja vsebnost formaldehida v izdelanih ivernih ploščah.

We have developed a process for liquefication of wood biomass, which represents a perspective for the efficient usage of biomass. Liquefaction of wood is achieved by addition of glycols and acidic catalysts at elevated temperatures. Addition of melamine to liquefied wood during polymerizations results in formation of adhesive for plywood and bonded wood. Adhesive from liquefied wood has equal or better binding properties than commercially available adhesives. The main advantage of the liquefied wood is a very low emission of formaldehyde.

- zmanjšanje emisije formaldehida (3,2 mg/100 g, trenutna zakonodaja je 4 mg/100 g)
- zdravju in okolju prijazno lepilo
- učinkovita izraba obnovljivih virov lesne biomase

- very low emission of formaldehyde (3,2 mg/100g comparing to current European formaldehyde emission standard which is 4 mg/100 g per bonded wood panel)
- adhesive with lower content of formaldehyde, therefore environmentally friendlier and less harmful to health.
- adhesive based on the renewable resources

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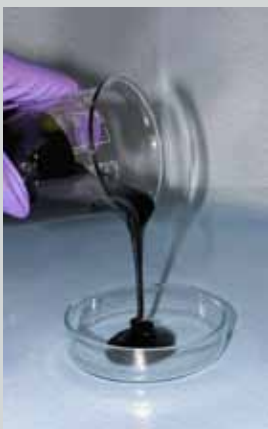

Utekočinjen les. (Foto: M. Kunaver, Laboratorij za polimerno kemijo in tehnologijo)
Liquified wood (Photo by M. Kunaver, Laboratory for Polymer chemistry and Technology)

Kompaktni sistem za recikliranje odpadnih voda

Compact system for recycling of greywater

recikliranje odpadnih voda, splakovanje sanitarij	greywater recycling, toilet flushing
industrija avtodomov, industrija kopalniške opreme, sistemi za recikliranje odpadnih voda	**industry of mobile homes, campers, industry of bathroom equipments, water recycling industry**
KI, L05, Laboratorij za okoljske vede in inženirstvo	NIC, L05, Laboratory for Environmental Sciences and Engineering
PCT/EPO patentna prijava	PCT/EPO patent application

Sistemi za recikliranje odpadne vode za splakovanje sanitarij uporabljajo neobdelano odpadno vodo, zato so pogoste zamašitve odtokov in pojav neprijetnega vonja.

Current systems for greywater recycling use untreated waste water for toilet flushing, thus drains are frequently clogged and smell appears.

Sanitarna odpadna voda, ki nastane po tuširanju, vsebuje organske snovi, trdne delce in mikroorganizme. Sestavili smo kompakten sistem za obdelavo odpadne sanitarne vode, ki temelji na intenzivni biološki razgradnji organskih snovi s pomočjo mikroorganizmov in omogoča recikliranje odpadne vode brez pogostih zamašitev in neprijetnega vonja. Prehitro rast mikroorganizmov v sistemu nadzorujemo z obsevanjem z UV svetlobo. Tako prečiščena voda iz našega kompaktnega sistema je uporabna za splakovanje stranišč in omogoča zmanjšanje porabe pitne vode do vsaj 30 odstotkov.

Sanitary waste water generated after showering or bathing in households contains dissolved organic matter, solid particles and micro-organisms. We have constructed a compact system for greywater treatment which is a combination of intensive biological process for removing dissolved organic matter and process for deactivating micro-organisms by UV treatment. The treated water is used for toilet flushing and therefore the consumption of drinking water can be reduced up to more than 30 %.

- zmanjšana poraba pitne vode
- ekološka stranišča
- sistem je primeren za manjša gospodinjstva
- možna masovna proizvodnja
- nizki stroški obratovanja in vzdrževanja

- reduces consumption of drinking water
- eco-friendly toilets
- suitable for smaller households
- possible mass production
- low operating and maintenance costs

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Sistem za recikliranje odpadnih voda (Foto: A. Pintar, Laboratorij za okoljske vede in inženirstvo)
Compact system for greywater recycling. (Photo: A. Pintar, Laboratory for Environmental Sciences and Engineering)

Pigmenti modificirani z aminosilani za pripravo spektralno-selektivnih premazov ter izdelava spektralno selektivnih površin

Aminosilane modified pigments for preparation of spectrally selective paint coatings

izkoriščanje sončne energije, spektralno selektivne površine , barvni večplastni premazi, nanomateriali, novi materiali

solar energy harvesting, spectrally selective surfaces, multilayer paint coatings, nanomaterials, new materials

premazi za solarno termiko, industrija barv in premazov, sončni kolektorji

solar thermal applications, manufacturers of solar absorbers, producers of painted metal sheets, solar collectors

KI, L02 Laboratorij za spektroskopijo materialov

NIC, L02 - Laboratory for the Spectroscopy of Materials,

Podeljen patent na tujem nacionalnem uradu

National patent granted at a foreign patent office

Velik del fosilnih goriv v energijski shemi je potrebno zamenjati z obnovljivimi viri energije. Za najbolj učinkovite obnovljive vire energije velja solarna termika. Za izdelavo sončnih kolektorje je potrebno najti cenovno bolj ugodne rešitve, kot so sedaj najbolj uporabljane kermentne spektralno selektivne površine, katerih slabost je visoka cena in slaba korozijska obstojnost.

A large part of the fossil fuels in the energy scheme has to be replaced with the renewable energy sources. The most effective renewable energy source are solar thermal collectors. There is a need for replacement of rather expensive and corosion instable cermet based spectrally selective surfaces for fabrication of solar thermal collectors.

Razvili smo postopek za pripravo premazov za izdelavo spektralno selektivnih površin, ki imajo boljšo selektivnost od premazov pripravljenih po starejših tehnologijah, izkazujejo boljši oprijem in stabilnostne lastnosti. Pigmentne delce modificiramo z reaktivnim aminosilanom, kar omogoča pripravo manjših delcev v pigmentni pasti in tudi boljše ujemanje anorganskega delca z organsko matriko (vezivom). Spektralno selektivne premaze lahko uporabimo tudi na že izdelanih zbiralnikih, kar je praktično nemogoče izvesti s kermeti.

We have developed spectrally selective paint coatings (SSPC) with better selectivity, adhesion and stability comparing to existing selective paint technology and PVD coatings. The pigment particles are modified with reactive silanes which enables preparation of smaller pigment particles and better compatibility of pigments with organic matrix. The use of spectrally selective paint coatings is possible on already assembled absorbers, that is impossible to be done with cermets.

- spektralno selektivni premazi imajo dobre antikorozijske lastnosti
- spektralno selektivni premazi so cenejši od kermentov zaradi enostavnega nanašanja
- termični kolektorji premazani s spektralno selektivnimi premazi imajo daljšo življenjsko dobo od kermetnih (boljša korozijska obstojnost)

- SSPC have outstanding anti-corrosion performance (much better than commonly used cermets)
- Spectrally selective surfaces made from paint coatings are considerably cheaper because of simple application technique
- SSPC allow production of more stable materials, thus longer warranty periods for thermal collectors can be offered for solar thermal collectors.

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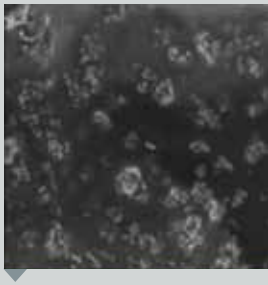

SEM mikrograf večplastnega premaza na površini (Foto: I. Jerman, Laboratorij za spektroskopijo materialov)
SEM micrograph of cured surface (Photo by I. Jerman, Laboratory for the spectroscopy of Materials)

Naprava za daljinsko sledenje vira sevanja med brahiterapevtskim zdravljenjem

Device for Remote Source Tracking During Brachytherapy Treatment

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brahiterapija, sistem za določanje položaja vira sevanja, iridij Ir192	brachytherapy, Iridium (Ir192), source tracking
izdelovalci medicinskih pripomočkov	**manufacturers of medical equipment**
IJS, F9, Eksperimentalna fizika osnovnih delcev	JSI, F9, Experimental Particle Physics
Skrivno znanje	Secret know-how

Pri brahiterapiji lahko pride do nenadzorovanih premikov izvira sevanja , kar lahko pacientu povzroči škodljive posledice.

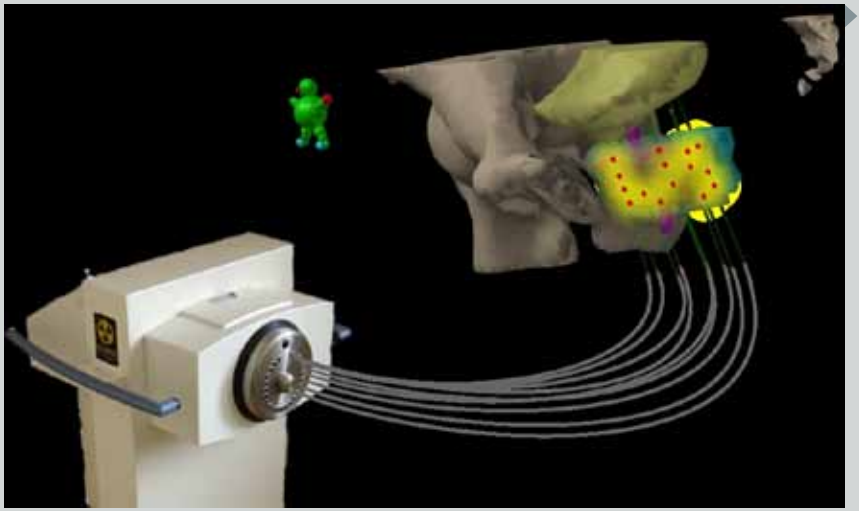
In brachytherapy, an unintentional movement of radiation source during therapy can result in adverse consequences for the patient.

Razvili smo napravo za sprotno (on-line) sledenje položaja izvira sevanja izotopa iridija (Ir192) med zdravljenjem raka z brahiterapijo. Naprava temelji na uporabi pozicijsko občutljivih polprevodniških detektorjev iz fizike osnovnih delcev. Naprava omogoča izboljšanje kakovosti zdravljenja predvsem pa je koristna pri preprečevanju neželenega obsevanja zaradi večjih premikov izvira.

We developed a device for online tracking of Ir192 source location during brachytherapy using detectors, readout electronics, data acquisition and data analysis methods from the field of particle physics. The system is useful in detecting and preventing unwanted irradiation caused by large accidental movements of the source.

- sprotna informacija o položaju izvira
- delovanje neodvisno od obsevalne naprave

- online monitoring of source location
- independent from irradiation systems



Shematski prikaz instrumenta za spremljanje sevanja med brahiterapijo (Vir: M. Batič, Eksperimentalna fizika osnovnih delcev)
Scheme of remote source tracking during brachiterapy (Source: M. Batič, Experimental Particle Physics)

Naprava za merjenje tokovnih odzivov detektorjev (Transient Current Technique TCT)

Compact Position Sensitive - Transient Current Technique (PS - TCT) measurement system

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polprevodniški pozicijsko občutljivi detektorji, TCT naprave	transient current technique, elementary particle physics
pozicijsko občutljivi detektorji za fiziko osnovnih delcev, dozimetrija, fotovoltaika, nuklearna medicina, radiologija	**elementary particle physics, dosimetry, photovoltaics, nuclear medicine and radiology**
IJS, F9, Eksperimentalna fizika osnovnih delcev	JSI, F9, Experimental Particle Physics
Skrivno znanje	Secret know-how

Visoke doze sevanja lahko resno poškodujejo polprevodniške detektorje v fiziki osnovnih delcev. Eden od izzivov za raziskovalce na tem področju je razvoj detektorjev za delovanje v visoko radioaktivnem okolju.

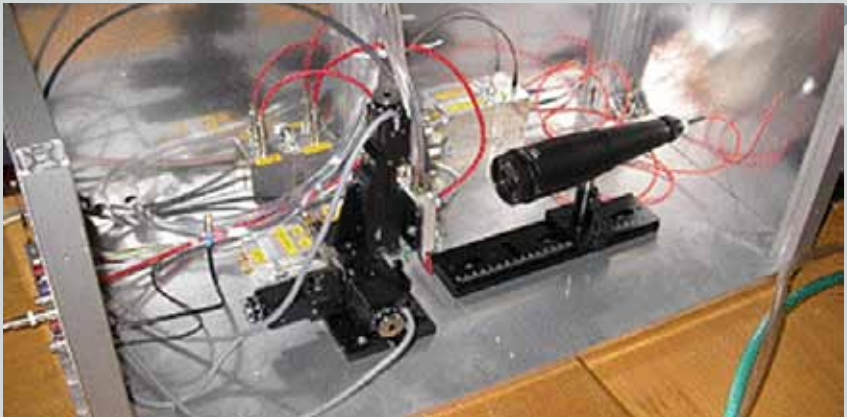
Exposure to high doses of radiation may damage semiconductor detectors. One of the major challenges for research in this field is the development of semiconductor detectors for highly radioactive environment.

Razvili smo sistem za merjenje signalov v polprevodniških detektorjih, ki se uporabljajo v fiziki osnovnih delcev. Naš sistem temelji na merjenju tokovnih odzivov (Transient Current Technique - TCT) detektorjev na kratke pulze fokusirane laserske svetlobe. Posebno inovativna je raba sistema s stranskim vpadom svetlobe, ki nam da neposredno informacijo o obliki električnega polja v detektorju, kar je odločilnega pomena za razumevanje delovanja obsevanih detektorjev.

We developed a cost effective system for measurements of signals in semiconductor detectors. The method is Transient Current Technique (TCT) – measuring of time resolved signals caused by pulses of focused laser light. The system enables TCT measurements with illumination of detector from the side (Edge –TCT). This gives direct information about the electric field shape in the detector, which is crucial for understanding the performance of irradiated detectors.

- celoten samostojni merilni sistem
- meritev TCT signalov s fokusiranim laserskim žarkom
- ceneje od trenutno razpoložljivih rešitev

- self standing stand measurement system
- TCT measurements with focused laser beam
- lower price than currently available solutions



Postavitev TCT sistema (Foto: I. Mandić, Eksperimentalna fizika osnovnih delcev)
Scanning TCT setup (Photo by I. Mandić, Experimental Particle Physics)

AVAMA – robot za avtomatsko spremljanje onesnaženosti zraka

AVAMA – robot

onesnaževanje zraka, avtonomno spremljanje onesnaževanja

air pollution, autonomous pollution monitoring

tovarne, dejavnosti, ki se ukvarjajo z onesnaženostjo zraka, vladne institucije za varstvo okolja

factories, facilities with air pollution, governmental air pollution inspection

IJS, F2, Fizika nizkih in srednjih energij

JSI, F2, Low and medium energy physics

Skrivno znanje

Secret know-how

Okoljski inšpektorji morajo svoj prihod k potencialnemu onesnaževalcu najaviti, kar onesnaževalcem zraka omogoča, da se na prihod inšpektorjev pripravijo in omejijo okolju škodljive dejavnosti.

Governmental environmental inspectors have to announce their inspection of air pollution which enables potential pollutant to hide their actions that normally are not legal according to the environmental legislation.

Naredili smo robota za avtomatsko spremljanje onesnaženosti zraka (AVAMA). Robot je opremljen z napravo za vzorčenje zraka in je sposoben leteti do želene lokacije. Zaradi majhnosti ga je zelo težko slediti, kar omogoča neodvisno spremljanje onesnaženosti zraka. Robot je uporaben za agencije, ki se ukvarjajo z onesnaženostjo zraka, kot tudi za vladne okoljske službe za spremljanje onesnaženosti. Poleg vzorčenja zraka nudimo tudi analizo aerosolnih vzorcev z elektronsko mikroskopijo, PIXE analizo in masno spektroskopijo.

We have developed Air Vehicle for Autonomous Monitoring of Atmosphere (AVAMA). AVAMA is a robot that independently flies to the desired location and elevation, small enough not to be easily spotted, with night flight capability and equipped to monitor the air pollution. It can be used by government environmental inspectors or companies interested in air pollution. We perform the entire service of pollution monitoring, aerosol sample analysis by electron microscopy, PIXE analyses and mass spectrometry.

- daljinsko upravljanje robota
- robot omogoča spremljanje onesnaženosti zraka neodvisno od časa in kraja
- nadzor nad onesnaževanjem je mogoče skriti

- no trespassing and remote operation
- AVAMA can monitor the air pollution independent of time, location or awareness of pollution violator
- monitoring of pollution can be hidden

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Meritve tlaka v zaprtih evakuiranih napravah – določitev trajnosti delovanja vakuumskih komponent

Pressure measurements in evacuated sealed devices as a lifetime assessment tool

Vakuumska tehnika, vakuumski sistemi, meritve vakuuma.

Vacuum technique, vacuum systems, pressure measurements.

spremljanje vakuuma v trajno zaprtih posodah, načrtovanje vakuumskih sistemov.

vacuum measurements in sealed envelopes, vacuum systems design.

IJS, F4, Odsek za tehnologijo površin in optoelektroniko, vakuumski laboratorij

JSI, F4, Surface engineering and Optoelectronics, Vacuum lab

Skrivno znanje

Secret know-how

Za delovanje mnogih elementov in naprav je treba zagotavljati ustrezen nizek tlak, kar narekuje izbiro postopkov priprave, izbiro materialov in spremljanje tlaka daljši čas po izdelavi.

Performance of many sealed devices depends on an appropriate low pressure maintained stable over a long operational time. This demand could only be fulfilled by a careful selection of materials and processing steps as well as by the ability to follow the pressure level over time.

Izvajamo meritve majhnih časovnih sprememb tlaka v nizkotlačnih in dobro razplinjenih sistemih in nudimo strokovno znanje na področju načrtovanja vakuumskih sistemov. Te vrste meritev so potrebne med vsako raziskovalno-razvojno fazo sinteze novih materialov, ki bodo vgrajeni v vakuum, ter kontrolo kakovosti naprav z zaprtimi evakuiranimi sistemi z dolgo dobo uporabnosti (vakuumska toplotna izolacija, elektronke, plinski prenapetostni odvodniki, itd). Izvajamo tudi meritve stopnje razplinjenosti izbranega materiala, permeabilnosti za pline skozi zelo neprepustne materiale, odkrivanje mesta puščanja, določanje plinske sestave v majhnih zaprtih sistemih, meritev toplotne prevodnosti v vakuumskih izolacijski ploščah v širokem razponu tlakov.

We offer an expertise in the low-pressure and outgassing related measurements and the related know-how. In order to obtain fast feedback on the pressure evolution, these skills and knowledge are absolutely necessary during the R&D phase and quality control of any evacuated sealed device with a long life-time such as: vacuum insulation panels (VIPs), electron tubes, gas surge arresters etc. We perform permeation measurements for various materials, vacuum processing, identification of leaks, determination of pressure and gas composition accumulated inside small sealed devices, measurements of thermal conductivity vs. internal pressure for planar vacuum insulation panels.

- merilni sistem lahko prilagodimo za tlačno področje po zahtevi naročnika
- testiranje materialov za vakuumske izolacijske panele poteka v tanki kovinski ovojnici, kar je bistvena prednost v primerjavi s klasičnimi rešitvami s polimerno ovojnico z vmesnimi plastmi aluminija
- za določanje tlaka se uporabljajo samo merilniki, ki ne vplivajo na tlak in sestavo plina

- testing system and schedule is designed to customer needs
- the envelope does not degrade with time at any reasonable temperature when compared to conventional Al laminated polymeric envelopes
- for the determination of pressure only inert gauges are being used

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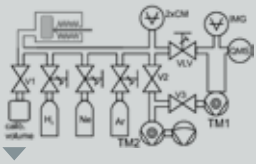

Shema univerzalnega vakuumskega sistema za meritve majhnih tlačni sprememb z možnostjo analize sestave plina s predhodno kalibriranim masnim spektrometrom (Vir: V. Nemanič, Odsek za tehnologijo površin in optoelektroniko, vakuumski laboratorij)

Schematic drawing of a multipurpose vacuum system for precise pressure change measurements and gas composition evaluation with a calibrated quadrupole mass spectrometer. (Source: V. Nemanič, Surface engineering and Optoelectronics, Vacuum lab)

3D mikrolaser za novo generacijo optičnih komunikacij

3D microlaser for new generation of optical communications

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3D mikrolaser	3D microlaser, omnidirectional microlaser
nove generacije optičnih komunikacij, optična holografija	**fiber-optic communications, holography**
IJS, F5, Fizika trdne snovi	JSI, F5, Condensed matter physics
PCT/EPO patentna prijava	PCT/EPO patent application

Omejitev navadnega laserja je, da pošilja koherentni in monokromatski svetlobni žarek le v določeni smeri. Laser, ki bi seval lasersko svetlobo v vse smeri, bi omogočil razvoj novih optičnih mikroelementov za optične komunikacije in služil kot točkast vir koherentne svetlobe za uporabo v holografiji.

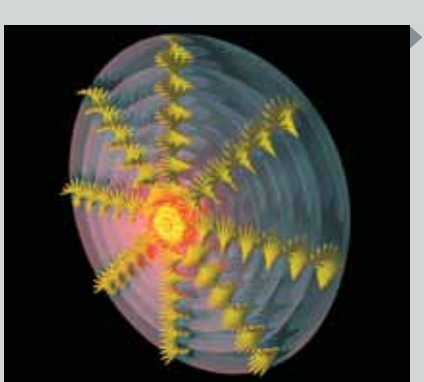
The limitations of currently used lasers is their emission of monochromatic and coherent light waves into only one direction. A laser, emitting the laser light in all directions, would allow for the development of new photonic microelements for optical communications and could serve as a point source of coherent light for applications in holography.

Prvi na svetu smo naredili 3D mikrolaser, ki oddaja koherentno lasersko svetlobo enakomerno v vse smeri. Mikrolaser je narejen iz mikrokapljic holesteričnega tekočega kristala, ki omogoča oddajanje svetlobe v vse smeri. Laser je majhen, nastavljiv, zelo poceni, pogoji za njegovo izdelavo pa so nezahtevni. Naša patentirana tehnologija obeta razvoj optičnih komunikacij nove generacije.

We have developed the world's first practical omnidirectional microlaser. The microlaser is formed from self-assembled cholesteric liquid-crystal microdroplets that emit light in all directions. The laser is small, tunable, and its production is cheap and simple. Our patented microlaser technology is especially useful for the new generations of fiber-optic communications.

- Naš laser je prvi 3D mikrolaser na svetu, ki ga je možno praktično uporabiti.
- Priprava 3D laserja je enostavna, saj temelji na kemičnih lastnostih tekočih kristalov, ki se sami uredijo v prostoru.

- The main advantage of our 3D laser is that it can be practically used. The laser is very easy to fabricate, because we are using molecular self-assembly process depending on the chemistry of materials, meaning that the fabrication process is simple and inexpensive.



Shematski prikaz ureditve tekočega kristala v holesterično mikrokapljico (Vir: Humar, Opt. Express, 2010)
The schematic view of the arrangement of cholesteric liquid-crystal molecules in a cholesteric micro-droplet. (Source: Humar, Opt. Express, 2010)

Varnostni sistem za spremljanje obsevne doze pri zunanji radioterapiji pacientov z rakom

A safety system for gamma-ray treatment of cancer

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zdravljenje s sevanjem gama, skener PET, rak	PET imager, gamma-ray treatment, cancer
radiologija, nuklearna medicina, onkologija	**nuclear medicine, radiology, oncology**
IJS, F2, Fizika nizkih in srednjih energij	JSI, F2, Low and medium energy physics
Skrivno znanje	Secret know-how

Pri zdravljenju raka z zunanjim obsevanjem je premajhno dozo težko zaznati, prevelika doza sevanja pa je za pacienta lahko tudi usodna.

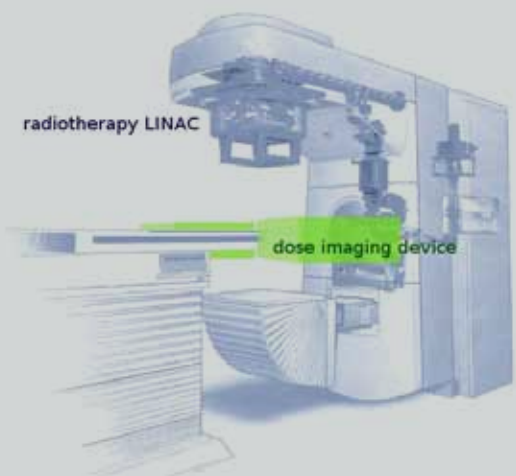
In medical radiation treatments inadequate dose is virtually undetectable and an overdose can kill the patient. No real-time system is available for the monitoring or imaging of the radiation field during patient treatment.

Razvili smo tehnologijo za koincidenčno detekcijo žarkov gama pri izredno visokih številnih hitrostih. V potencialnem kontekstu emisijske tomografske kamere (PET) je ob obsevanem pacientu moč v realnem času meriti signal pozitronske anihilacije zaradi inducirane tvorbe parov v primarnem terapijskem curku. To je neposredna mera za dejansko hitrost odlaganja doze v tkivu.

We have developed technology that allows buildup of a safety system for gamma-ray treatment of cancer. The target concept is an application-specific Positron Emission Tomography (PET) imager that can be positioned and operated at the patient's side during the gamma-ray therapy. During the patient treatment, the system measures the actual absorption of the gamma-rays and, by feedback, assures safe irradiation.

- edini znani koncept za merjenje dejansko absorbirane doze žarkov gama med potekom zdravljenja
- sistem zagotavljanja nadzorovane doze sevanja in tako varnejše in bolj uspešno zdravljenje raka

- the only known concept to literally address the actual dose rate as deposited in tissue in real time
- a safer and more successful cancer therapy



Varovalni sistem za zdravljenje raka (Vir: M. Vencelj, Fizika nizkih in srednjih energij)
A safety system for gamma-ray treatment of cancer (Source: M. Vencelj, Low and medium energy physics)

Temperaturna kompenzacija signalov iz scintilacijskih detektorjev

Digital processor for scintillation detection systems

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scintilacijski detekcijski sistemi, digitalna obdelava sunkov, temperature

scintillation detection systems, digital pulse analysis, temperature

medicinski pripomočki, dozimetrija, fizika visokih energij, procesna tipala

medical devices, radiation therapy, dosimetry, high-energy physics, industrial probes

IJS, F2, Fizika nizkih in srednjih energij

JSI, F2, Low and medium energy physics

Skrivno znanje

Secret know-how

Pri večini scintilacijskih detektorjev je zaradi velike občutljivosti odziva na temperaturo potrebna kalibracija aparature na kraju meritve, za kar je navadno potrebno usposobljeno osebje.

In many scintillation detectors, the pronounced temperature dependence of the sensor response requires cumbersome on-site calibrations and trained personnel.

Razvili smo digitalni procesor za obdelavo podatkov pridobljenih iz scintilacijskih detektorskih sistemov, ki bistveno zniža občutljivost scintilacijskih detektorjev na temperaturo. Sistem analizira signale iz scintilacijskih detektorjev in z ustrezno algebraično obdelavo spektroskopskih sunkov odpravi vpliv temperature na rezultat meritve.

We have developed a digital processor for scintillation detection systems that minimizes the impact of temperature on the results of measurements. The processor acquires and analyses signals from scintillation detectors, based on a combination of digital pulse analysis and a robust computational approach that compensates for the temperature dependence of the scintillation response.

- bistveno nižji stroški namestitve in kalibracije
- znižana občutljivost scintilacijskega detektorja na temperaturo

- significantly reduced costs of installation and calibration
- decreased temperature dependence of the sensor

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