Report

on the postdoctoral project

02.01.2019 – 31.12.2021

"Investigation of photoinduced processes in one dimentional ZnO/polydopamine nanostructures"

Līg.Nr.: 1.1.1.2/VIAA/2/18/279

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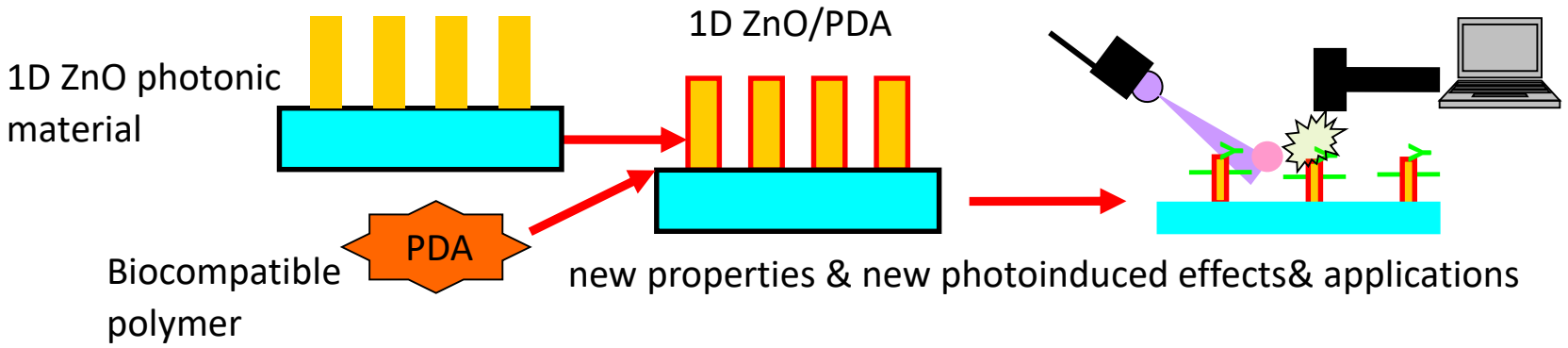
Valsts izglītības attīstības aģentūra
NACIONĀLAIS ATTĪSTĪBAS PLĀNS 2020
EIROPAS SAVIENĪBA
Eiropas Reģionālās attīstības fonds
IEGULDĪJUMS TAVĀ NĀKOTNĒ

Project goal

To develop one-dimensional (1D) composite ZnO/polydopamine (PDA) nanomaterials with a high surface-to-volume aspect ratio, to improve the electronic, optical and sensitive properties of the structure for detection specific biomolecules.



Objectives

- To investigate structure properties, electronic and photoinduced processes in 1D ZnO/PDA nanostructures with different geometry;
- To tailor surface properties of 1D ZnO/PDA nanostructures via biofunctionalization;
- To investigate sensor properties of biomodified 1D ZnO/PDA nanostructures towards model molecules using PL and photoelectrochemical methods;
- To analyze correlation between structure, electronic, optical and sensitive properties of 1D ZnO/PDA nanostructures.

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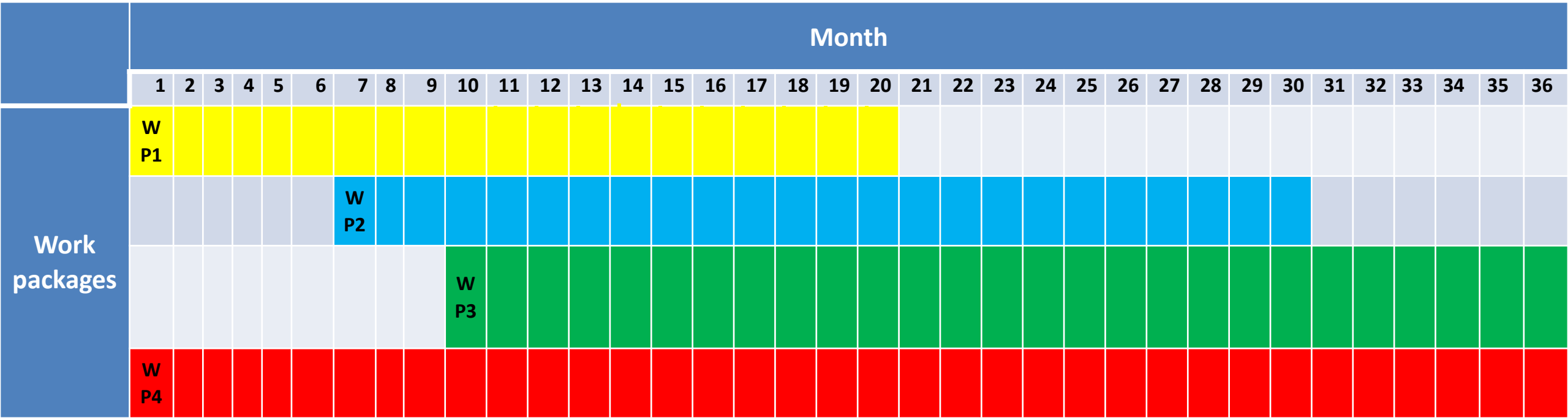
Work packages

1. Synthesis, structure and optical characterization of 1D ZnO/PDA nanostructures (month 1-20)
2. Investigation of sensitive properties of 1D ZnO/PDA nanostructures (month 7-30)
3. Analysis and modelling of photoinduced processes in 1D ZnO/PDA nanostructures (month 10-36)
4. Dissemination of the results and Project management (month 1-36)



Results

	2018				2019				2020				2021				2022					
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	Plāns	Kopā
Publikācija									1	1		1			1						4	4
Konferenču tēzes vai abstrakts							1						1								3	2
ASI Semināri						1		1				1									6	3
Pētnieka nakts/laboratoriskajās demonstrācijās						1	1				1			1							2	4
atvērtās lekcijās									1	1	1										2	3
Semināri valsts aģentūrām									1	1											2	2

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Research team

Laboratory team

- Dr. Roman Viter - Leading researcher / head of laboratory - Supervisor
- Daina Damberga - Research assistant
- Kārlis Grundšteins – Engineer
- Sahin Altundal – Engineer
- Aleksandr Kapralov - Engineer-glass blower

Internal collaboration

- University of Latvia, Institute of Chemical Physics: Prof. Donats Erts

External collaboration

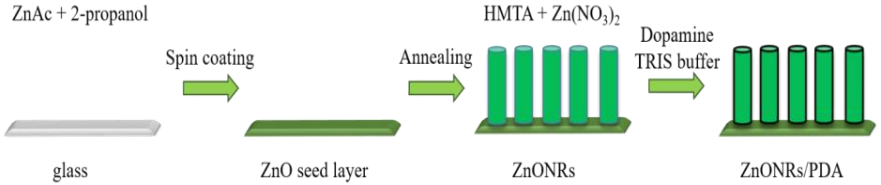
- University of Montpellier, European Institute of the Membranes (Montpellier, France)
  Dr. Mikhael Bechelany, Dr. Octavio Graniel.
- Adam Mickiewicz University, NanoBioMedical Centre (Poznan, Poland):
  Dr. Igor Iatsunskyi, Prof. Stefan Jurga, Dr. Radoslaw Mrowczynski, and Dr. Emerson Coy.
- Vilnius University (Vilnius, Lithuania)
  Prof. Arunas Ramanavicius, Prof. Almira Ramanaviciene, and Dr. Anton Popov.
- Sumy State University, Medical Institute (Sumy, Ukraine)
  Dr. Pogorielov Maksym, Dr. Viktoriia Holubnycha, Dr. Viktoriia Korniienko.
- Materials Research Center (Kyiv, Ukraine)
  Oleksiy Gogotsi

Publications

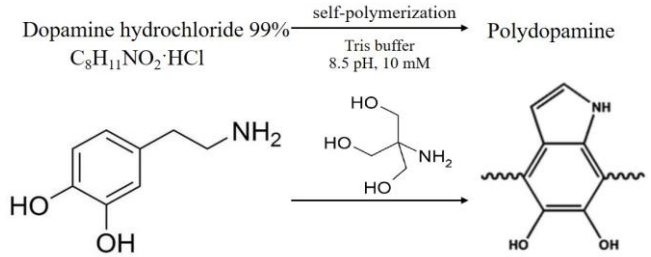
Title of the publication	Journal impact factor	Scopus/ WOS	Stage (published, submitted for review, etc.)
Fedorenko, V., Damberga, D., Grundsteins, K., Ramanavicius, A., Ramanavicius, S., Coy, E., ... & Viter, R. (2021). Application of polydopamine functionalized zinc oxide for glucose biosensor design. *Polymers*, *13*(17), 2918.	4.329	+	published
Damberga, D., Viter, R., Fedorenko, V., Iatsunskyi, I., Coy, E., Graniel, O., ... & Bechelany, M. (2020). Photoluminescence study of defects in ZnO-coated polyacrylonitrile nanofibers. The Journal of Physical Chemistry C, 124(17), 9434-9441.	4.189	+	published
Fedorenko, V., Viter, R., Mrówczyński, R., Damberga, D., Coy, E., & Iatsunskyi, I. (2020). Synthesis and photoluminescence properties of hybrid 1D core–shell structured nanocomposites based on ZnO/polydopamine. RSC Advances, 10(50), 29751-29758.	3.070	+	published
Damberga, D., Fedorenko, V., Grundšteins, K., Altundal, Ş., Šutka, A., Ramanavičius, A., ... & Viter, R. (2020). Influence of PDA Coating on the Structural, Optical and Surface Properties of ZnO Nanostructures. Nanomaterials, 10(12), 2438.	4.446	+	published
2 publications under preparation			

Synthesis and photoluminescence properties of hybrid 1D core–shell structured nanocomposites based on ZnO/polydopamine

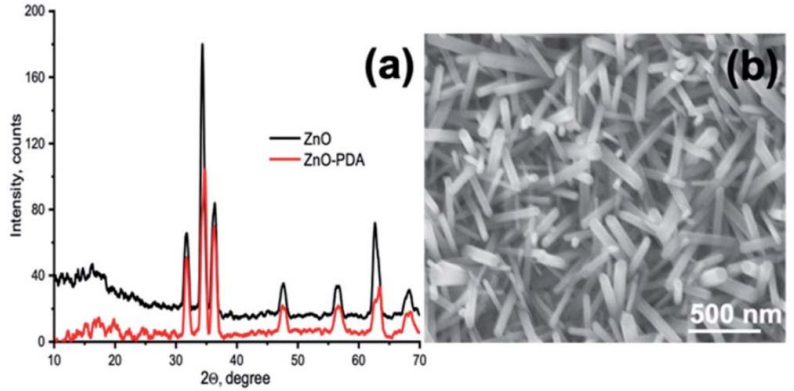
Synthesis of ZnO-PDA nanorods



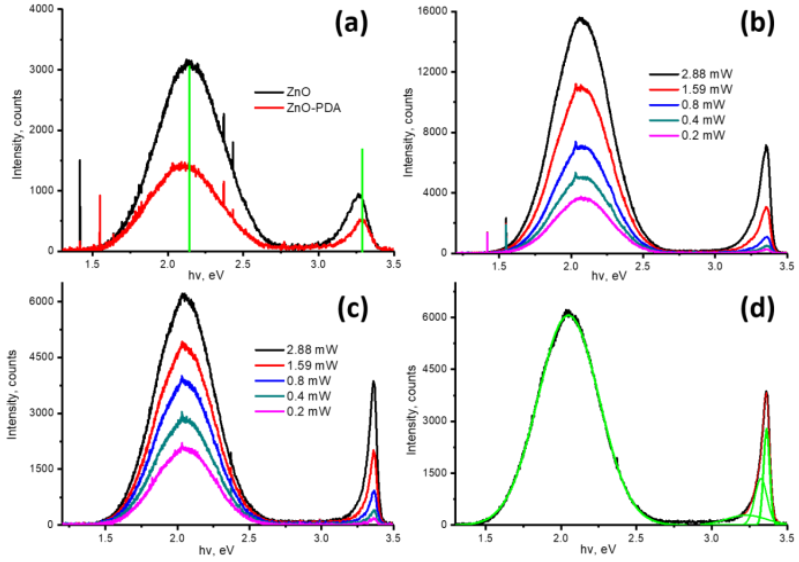
Self-polymerization of dopamine to PDA



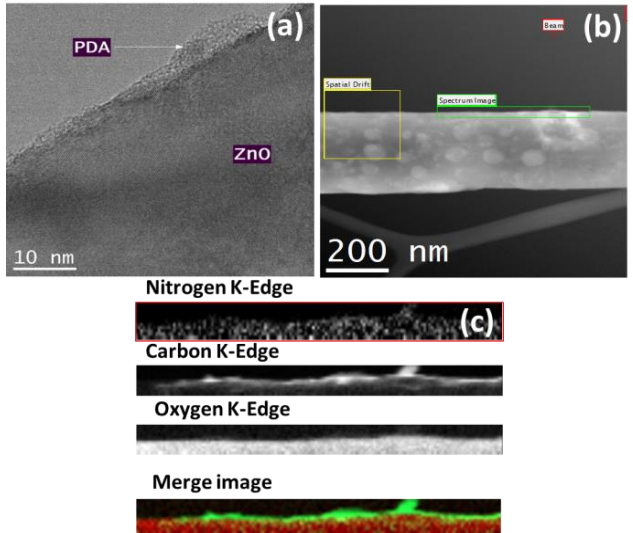
Structural properties of ZnONRs/PDA



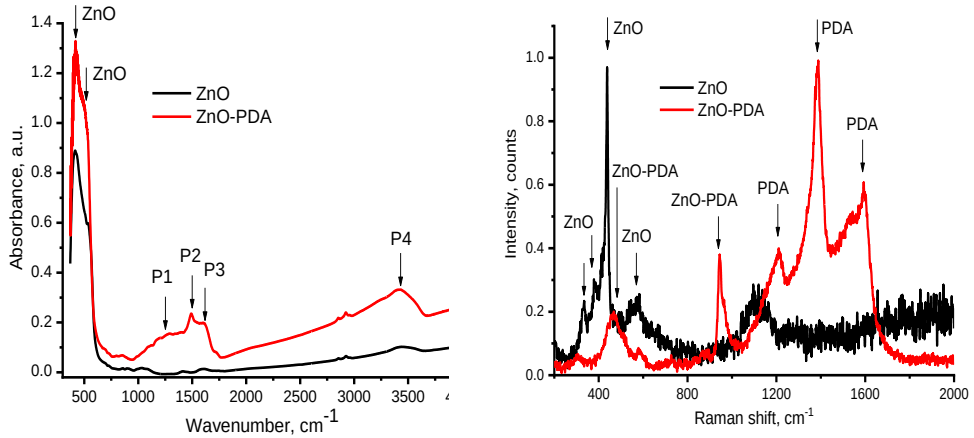
Optical properties of ZnO-PDA NRs: PL spectroscopy



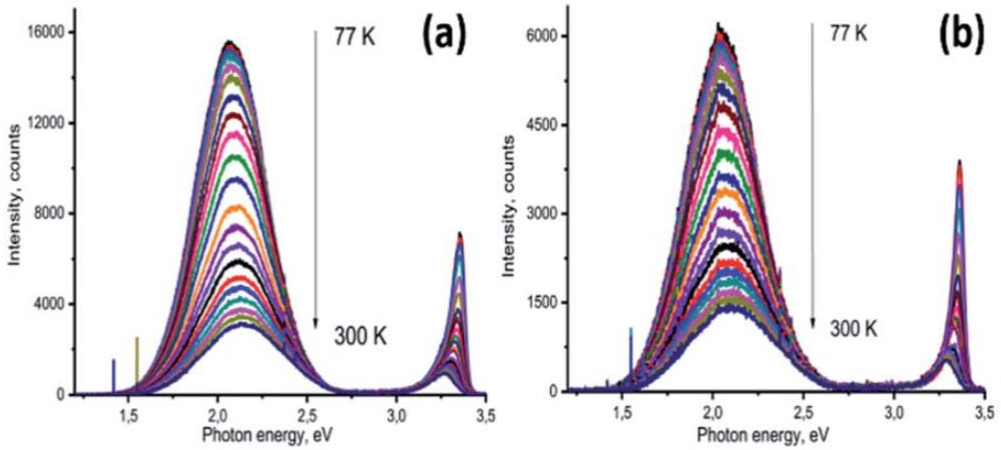
Structural properties of ZnONRs/PDA



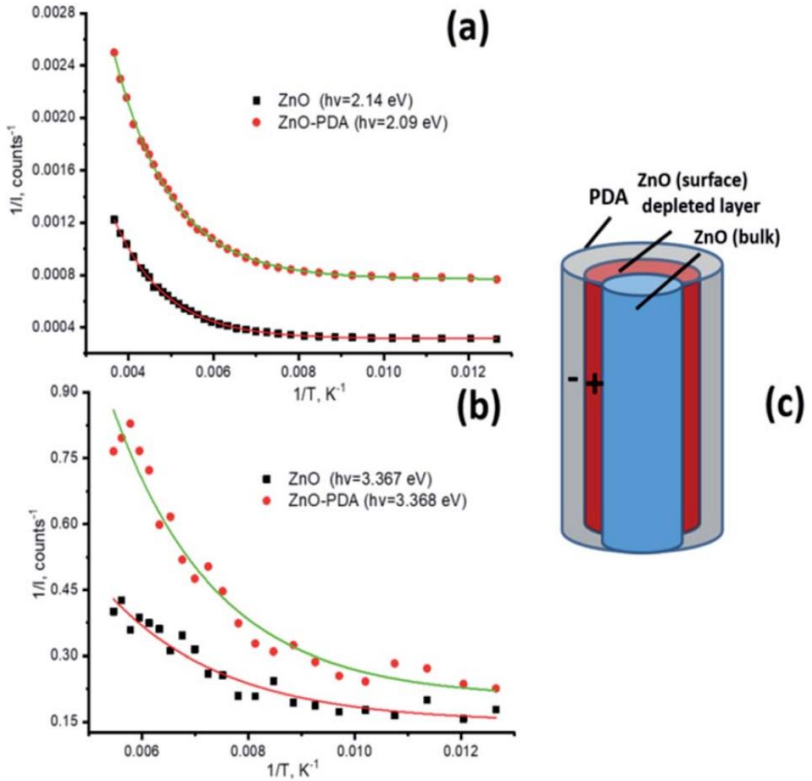
Electronic properties of ZnONRs/PDA: FTIR, Raman spectroscopy



Synthesis and photoluminescence properties of hybrid 1D core–shell structured nanocomposites based on ZnO/polydopamine



Photoluminescence temperature dependence of ZnONRs (a) and ZnONRs–PDA (b)



Exponential approximation for activation energy calculations (a and b). The model of forming ZnO/PDA interface (c).

Table 1 Evaluation of ZnO and ZnO–PDA activation energies

	2.14–2.09 eV	3.28–3.27 eV	3.34–3.33 eV	3.367 eV
ZnO	0.074	0.018	0.024	0.053
ZnO–PDA	0.064	0.01	0.013	0.044

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Conclusions. Synthesis and photoluminescence properties of hybrid 1D core–shell structured nanocomposites based on ZnO/PDA

- A comprehensive modelling of the processes on ZnO/PDA interface have been represented.
- The defect concentrations in ZnO before and after PDA deposition were calculated. Decrease of defects concentration, participating in PL and quantum efficiency was shown.
- The correlation between structural and optical properties of ZnO/PDA nanostructures was evaluated.
- TEM results demonstrated the ability to produce conformal PDA coating over ZnO nanorods.
- Change of FTIR and Raman spectra, due to the formation of ZnO/PDA composite suggest that PDA is attached to the ZnO via –OH groups in PDA structure.
- Defect levels of ZnO (oxygen vacancies) are involved in forming ZnO–PDA interface. Interaction of the defect levels with hydroxyl groups causes a decrease of the defect concentration, PL intensity and quantum efficiency.
- A decrease of activation energies and shift of the PL peaks observed in ZnONR–PDA nanostructures is explained by formation of additional electrical local field between PDA and ZnO.

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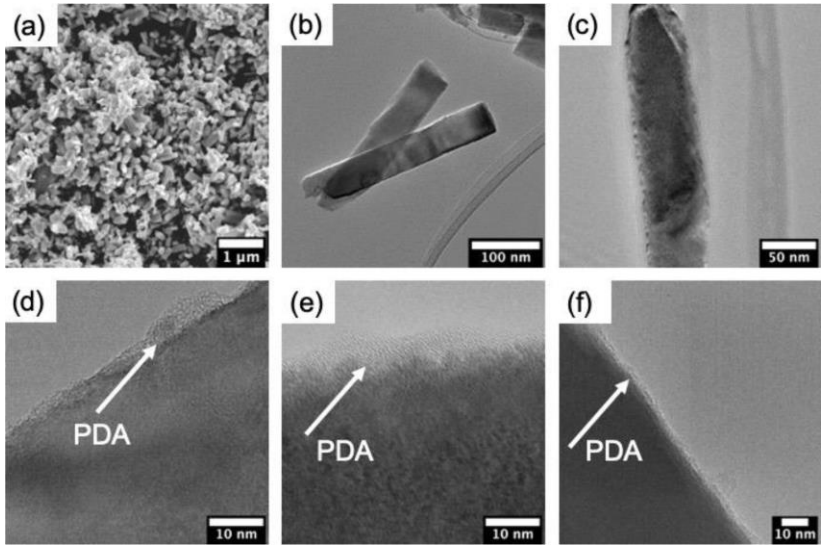
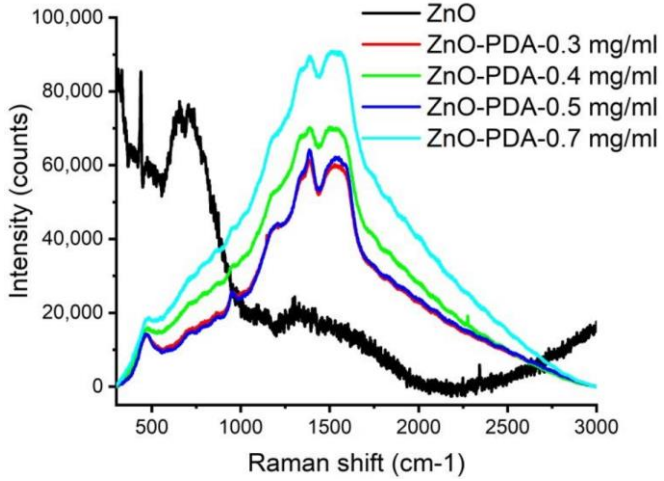
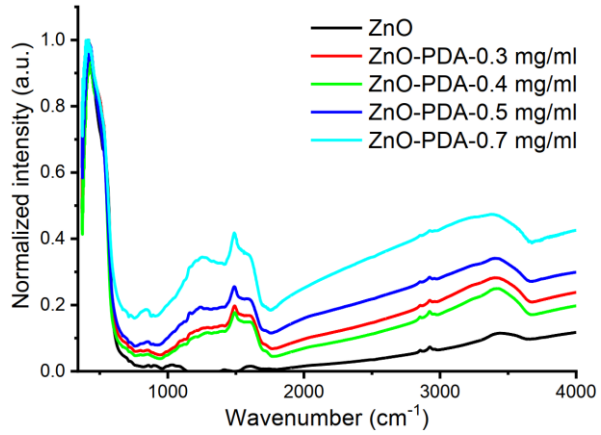
Influence of PDA Coating on the Structural, Optical and Surface Properties of ZnO Nanostructures

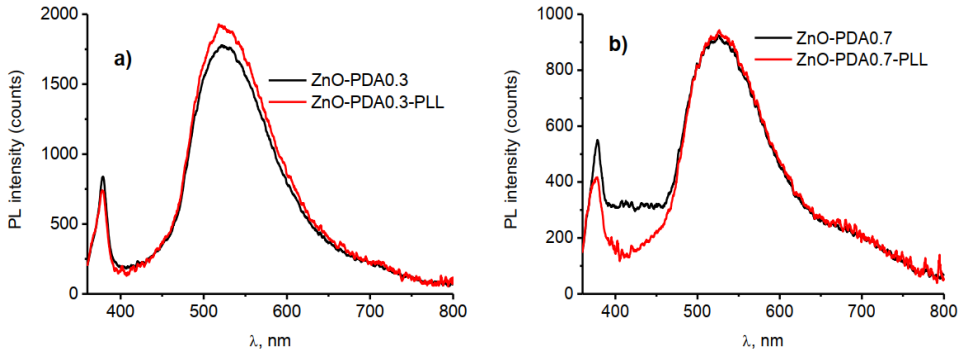


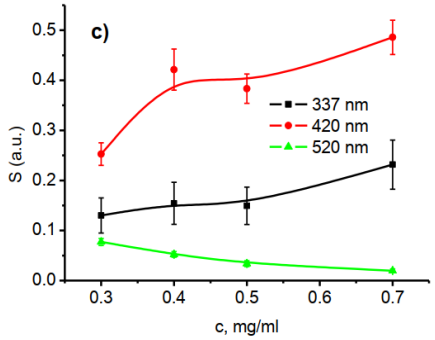


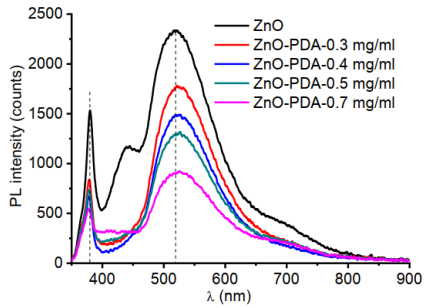


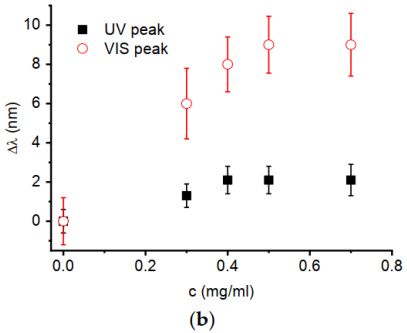
Optical characterization of ZnO–PDA NRs with various PDA concentration

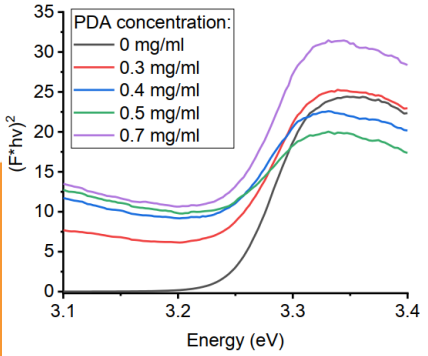
ZnO–PDA nanorods response to PLL

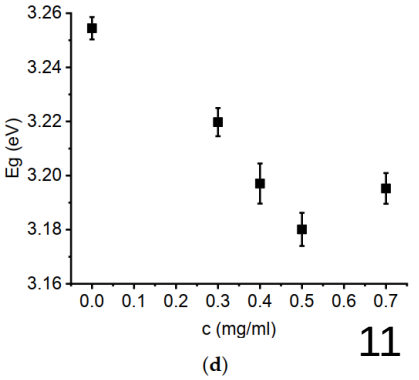












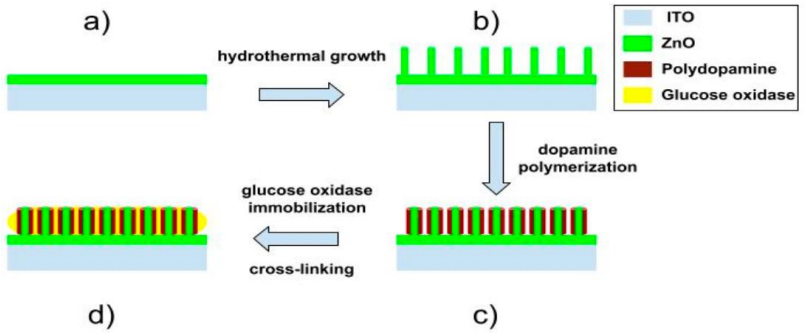
z-potential

ZnONRs	ZnONRs /PDA
+28.8 ± 7.1 mV	-27.5 ± 5.3 mV

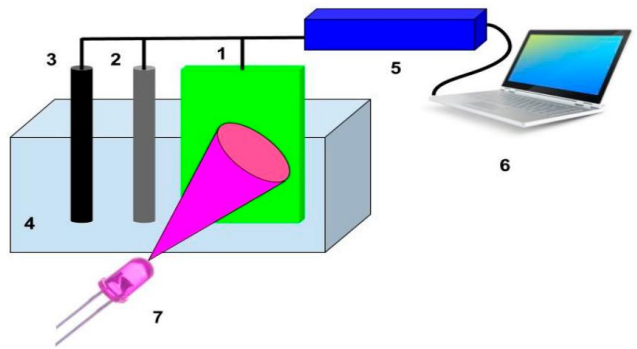
Conclusions. Influence of PDA Coating on the Structural, Optical and Surface Properties of ZnO Nanostructures

- The first data on PDA concentration influence on ZnO–PDA nanocomposite properties and sensing have been represented.
- Correlation between the structural and optical properties of 1D ZnO–PDA nanostructures was evaluated.
- The detailed study of structural and optical properties of ZnO–PDA nanocomposites was represented.
- TEM images demonstrated the ability to produce conformal PDA coating over ZnO nanorods after optimizing the concentration of precursors.
- The progressive coverage of the PDA layer shows the gradual decrement in the optical bandgap of ZnO.
- Based on FTIR and Raman spectroscopy measurements, it is suggested that PDA was attached to the ZnO via –OH groups.
- The interaction between ZnO–PDA and the model poly-l-lysine molecules showed the change of PL spectra in the UV and visible ranges.
- Changes in the emission intensity in the UV range are related to PLL–PDA interaction, changes in visible spectra correspond to ZnO–PLL interaction. The ZnO–PLL interaction rate was suppressed at higher PDA concentrations (0.5 and 0.7 mg/mL).

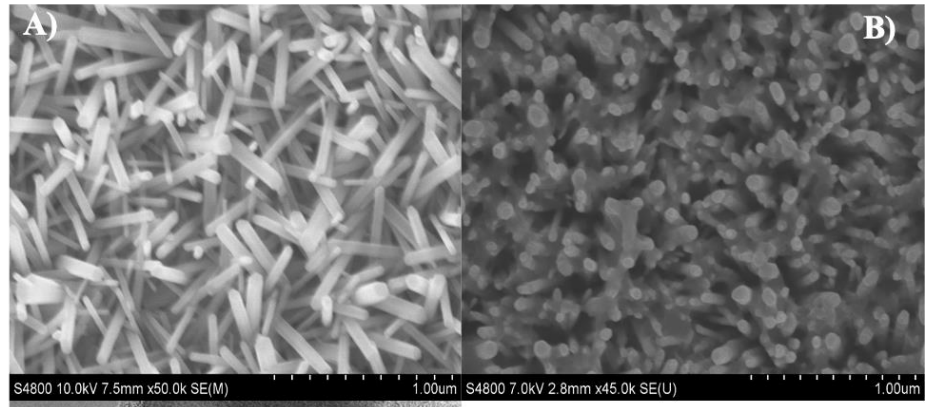
Application of Polydopamine Functionalized Zinc Oxide for Glucose Biosensor Design

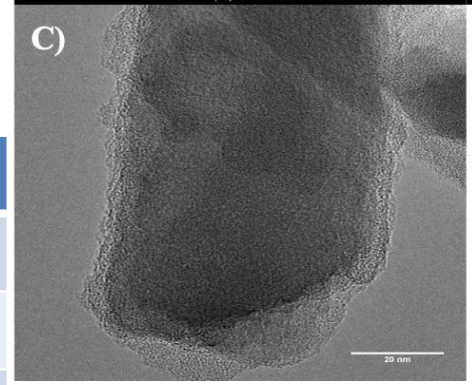


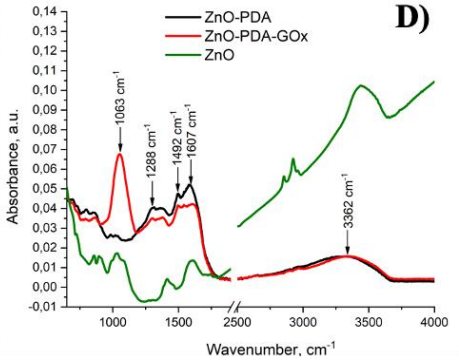
(A)

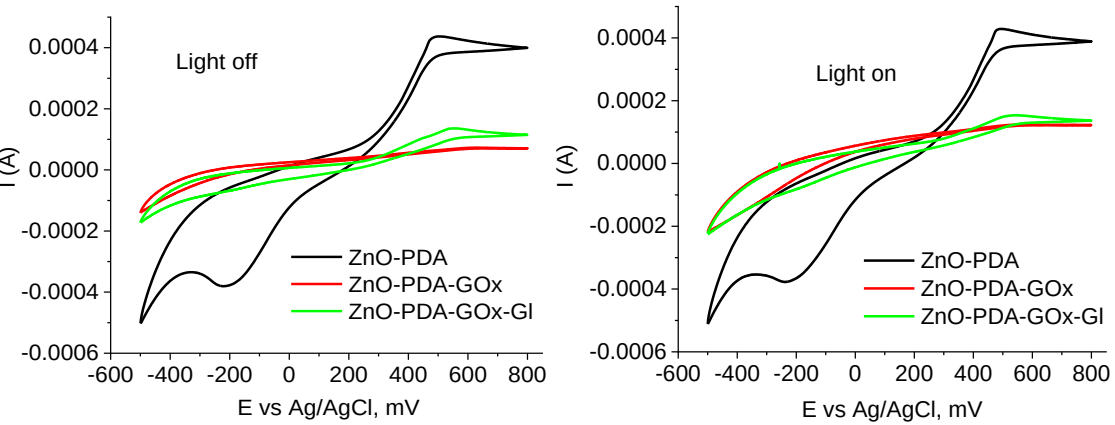


(B)









1288 cm^{-1}	C-O
1492 cm^{-1}	C=N, C=C
1607 cm^{-1}	C=O
3362 cm^{-1}	-OH, N-H

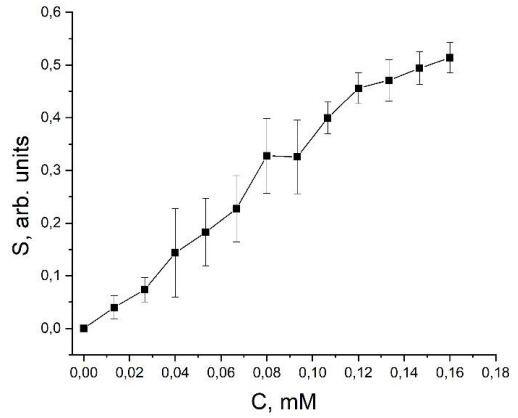
Measurement range: -500 – 800 mV
Scanning speed: 50 mV

$$I_S = I_{UV} - I_{dark}$$

$$S = 1 - \frac{I_S(C)}{I_S(0)}$$

LOD: 0.0062 mM

S: 0.015 – 0.12 mM



Calibration curve of sensor response vs. glucose concentration.

Conclusions. Application of Polydopamine Functionalized Zinc Oxide for Glucose Biosensor Design

- A significant decrease of current due to the GOx layer formed on the ZnO-PDA structure have been observed.
- Catalytic oxidation of glucose by glucose oxidase resulted in a concentration-dependent photo-electrochemical response of glass/ITO/ZnOPDA/GOx-based electrode towards glucose.
- Chronoamperometric signals were measured at UV-illumination and in the 'dark', and the difference of measured amperometric signals was interpreted as an analytical signal suitable for the determination of glucose concentration in the sample.
- Fast response and reliable sensor response were registered in the glucose concentration range of 0.0062–0.120 mM.

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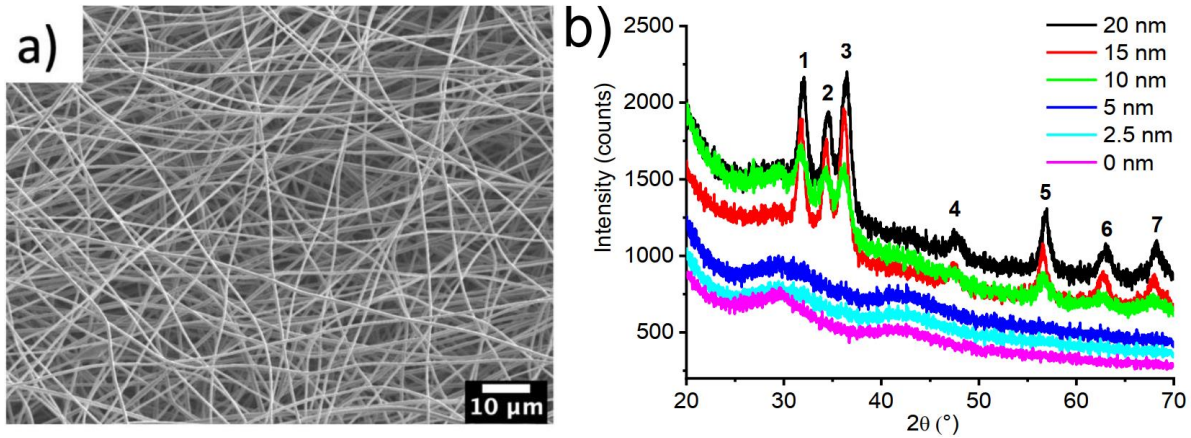
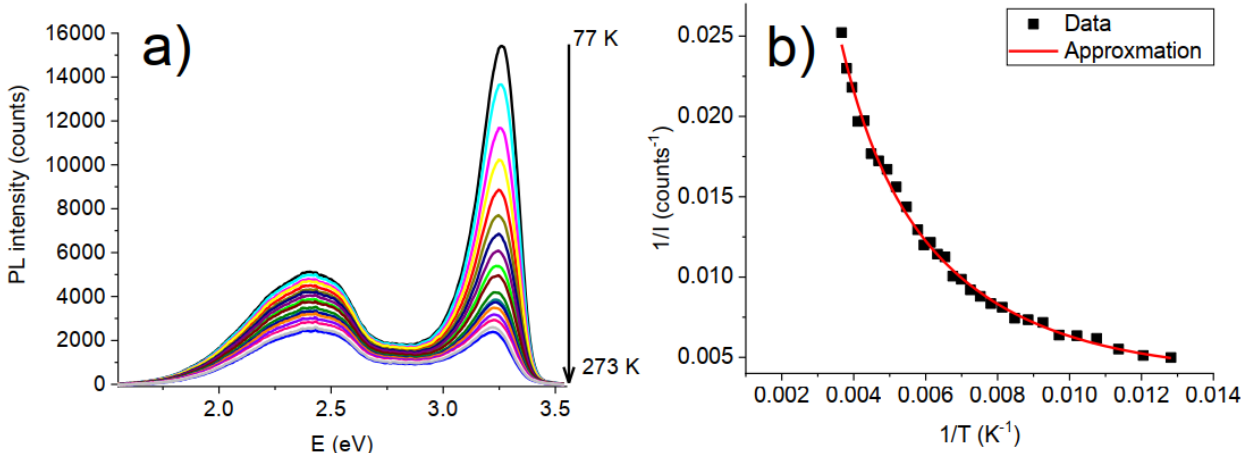
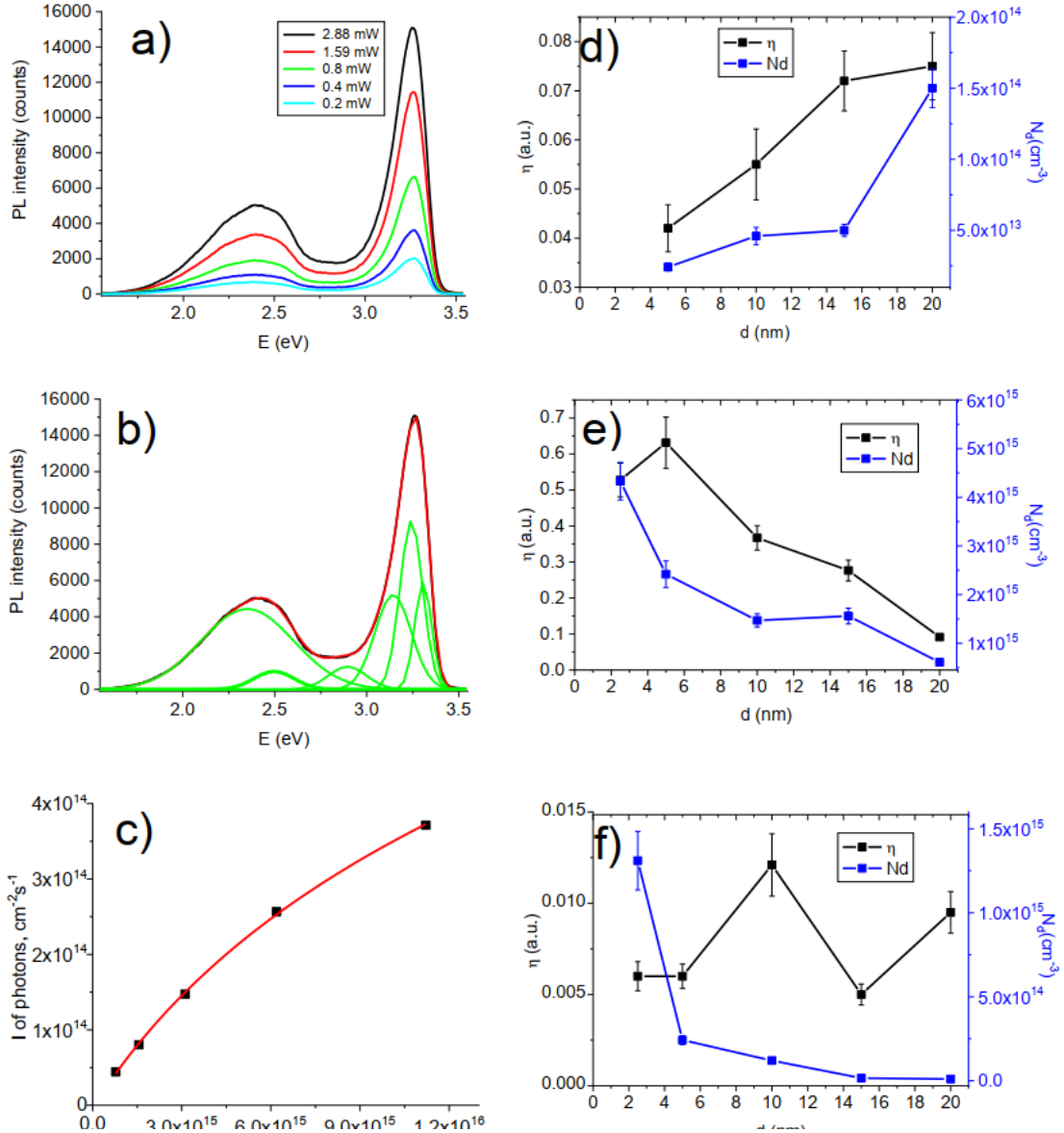
Photoluminescence Study of Defects in ZnO Coated Polyacrylonitrile Nanofibers



(a) SEM images of the 1D ZnO nanostructures obtained with 300 s electrospinning time and coated with 50 cycles of ZnO by ALD at 373 K. (b) XRD data for samples of ZnO with thicknesses



PL temperature dependence for the 20 nm sample (a); exponential approximation for Ea calculations - 20 nm sample



PL power dependence measurements with different neutral density filters for 20 nm sample.

Conclusions. Photoluminescence Study of Defects in ZnO Coated Polyacrylonitrile Nanofibers

- The increase of the ZnO thickness results in an improvement of the crystallinity, a decrease of the defect concentration, and an increase of the strain.
- An amorphous to crystalline phase transition occurs for ZnO film thicknesses higher than 10 nm.
- Due to the strain effects, shifts of the XRD and PL peaks were observed.

A careful analysis of defect states in ZnO showed that the samples have two common peaks that correspond to singly ionized and doubly ionized oxygen vacancies. These defects are responsible for changes in the visible portion of the PL emission.

- PL UV peak shift of exciton emission from 20 nm – 15 nm ZnO is explained by the decrease of grain size. Excitonic peaks for ZnO 15 nm and 20 nm are shifted towards lower energies compared to literature data because of the surface strain.
- The quenching of UV emission in samples lower than ZnO 15 nm results from lower crystallinity, higher defect concentrations and surface band bending.

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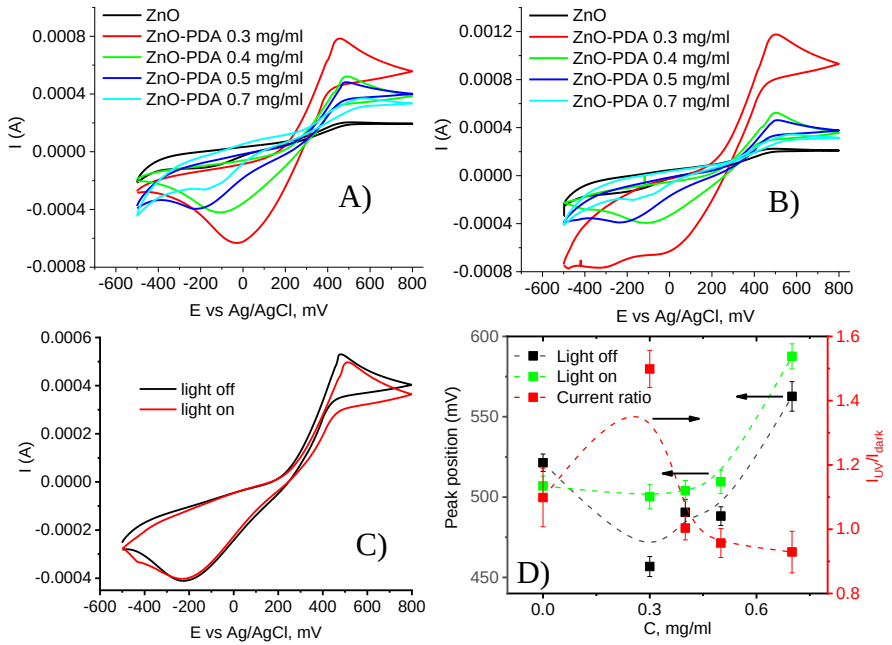
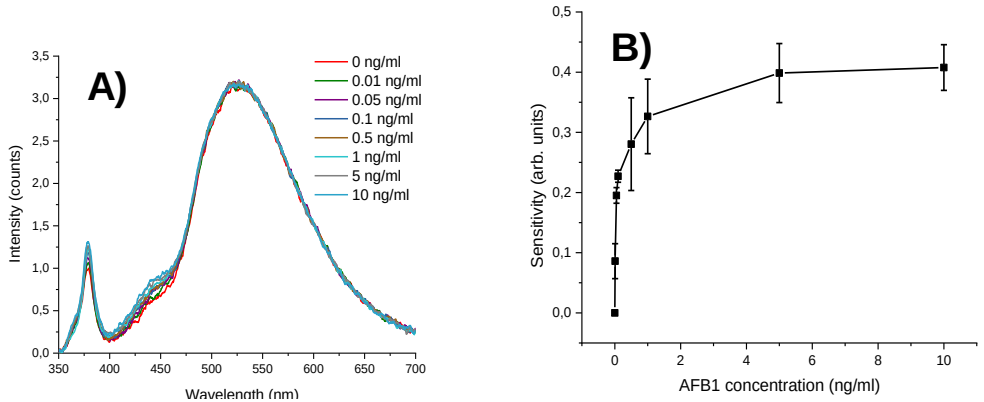
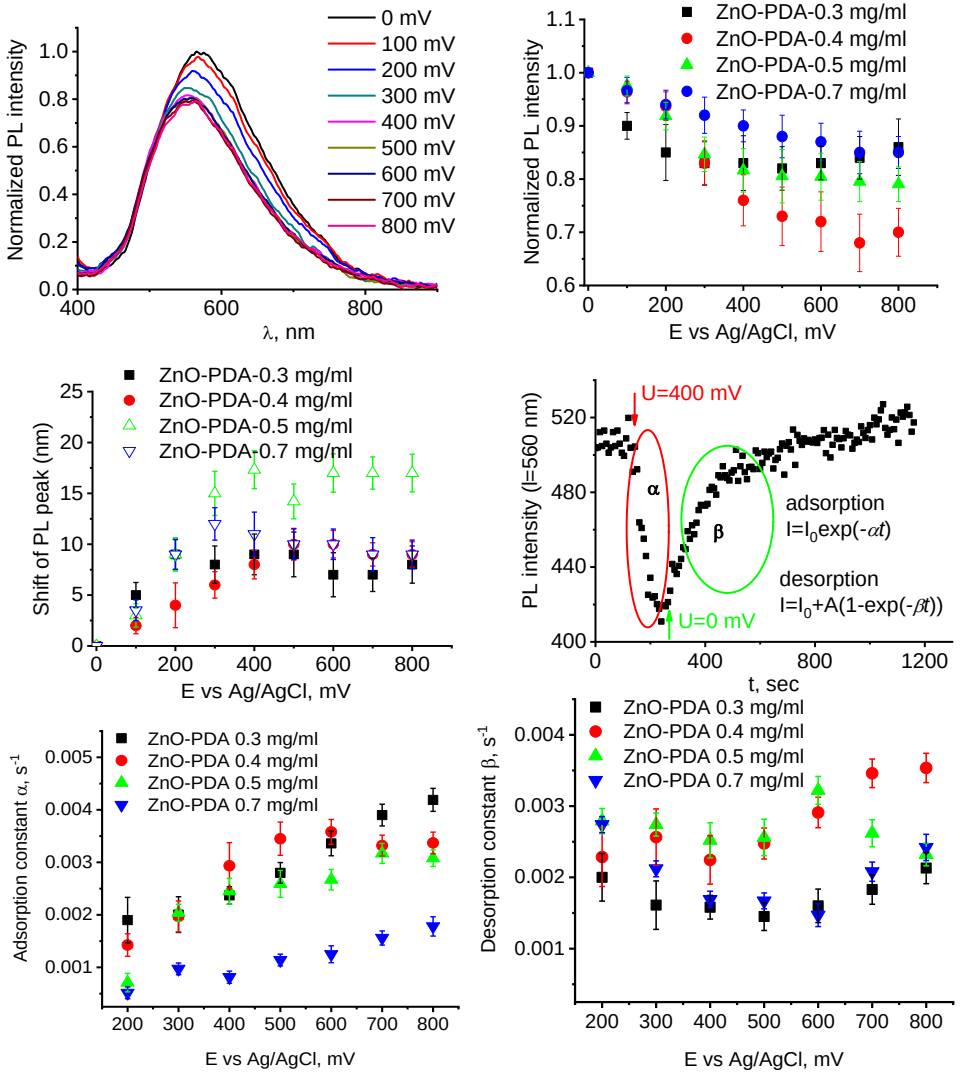
Publications under preparation



Results of electrochemical measurements



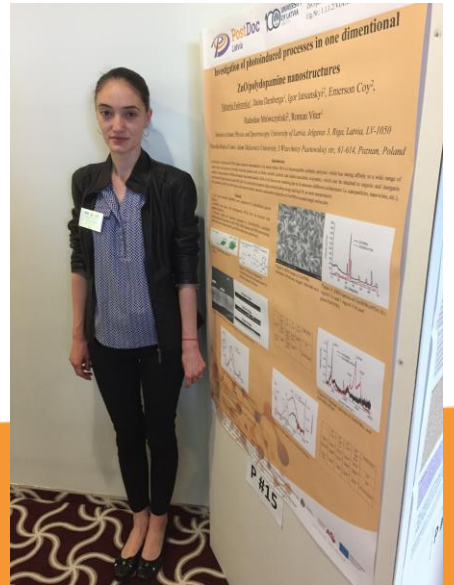
PL spectra of ZnO/PDA/PEI at different AFB1 concentrations, B) Sensitivity of ZnO/PDA/PEI AFB1 sensor



Chronoamperometry based evaluation of FTO-electrode modified by ZnO-PDA nanostructures: A) PL quenching at different applied potentials B) PL intensity quenching at different applied potentials C) PL shift at different applied potentials; D) kinetic response at fixed potential; E) adsorption time constant at different applied potentials; F) desorption time constant at different applied potentials.

Conferences

Place	Date	Duration (days)	Conference
Riga, Latvia	14.02.2019	1	78th International Scientific Conference of the University of Latvia. Poster session.
Jurmala, Latvia	02.07.2019 04.07.2019	3	International conference "Nanomaterials for biosensors and biomedical applications". Poster session.
Warsaw University of Technology Poland, Warsaw	15.09.2019 19.09.2019	5	Autumn meeting of the 2019 E-MRS (European Materials Research Society). Symposium M: “Metal oxide- and oxyhydride-based nanomaterials for energy and environment-related applications”. Oral presentation.



Conferences

Place	Date	Duration (days)	Conference
Riga, Latvia	25.09.2020	1	Knowledge Agora. Oral presentation.
Zoom platform	12.02.2021	1	79th International Scientific Conference of the University of Latvia. Oral presentation.
Zoom platform	18.02.2021 19.02.2021	2	2nd Global Virtual Summit on Advances in Materials, Physics & Chemistry Science. Oral presentation.
Zoom platform	26.10.2021 28.10.2021	3	International Medical Conference «BIOMEDICAL PERSPECTIVES III». Organized by Medical Institute of Sumy State University. Oral presentation.

Mobility

Host institution	Date	Duration (days)
Materials Research Center Kyiv, Ukraine	22.07.2021 - 21.09.2021	62
Sumy State University Sumy, Ukraine	06.01.2021 - 06.03.2021	60
Vilnius University, Faculty of Chemistry and Geosciences Vilnius, Lithuania	14.12.2020 - 23.12.2020 (virtual mobility)	10
Vilnius University, Faculty of Chemistry and Geosciences Vilnius, Lithuania	08.06.2020 – 12.06.2020	5
Warsaw University of Technology Poland, Warsaw	15.09.2019 - 19.09.2019	5
University of Latvia Latvia, Jurmala	02.07.2019 - 04.07.2019	3
European Institute of Membranes at University of Montpellier Montpellier, France	21.04.2019 - 28.04.2019	8
NanoBioMedical Centre, Adam Mickiewicz University, Poznan, Poland	04.02.2019 - 15.02.2019	12

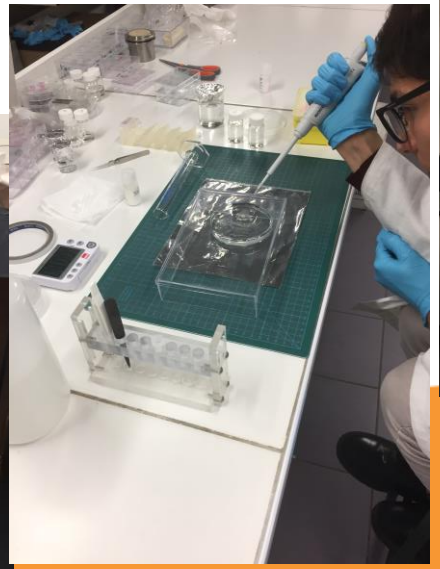
Total – 165 days

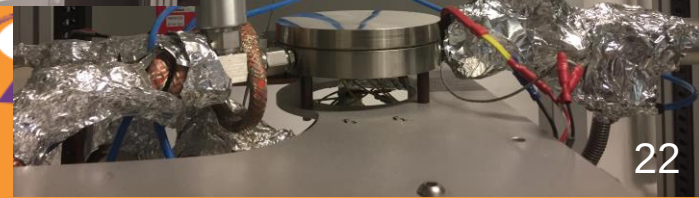
Mobility

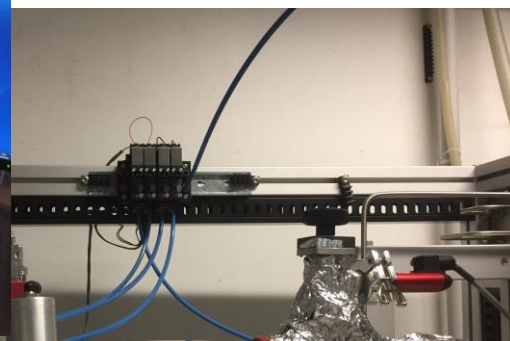
Host institution	Date	Duration (days)	Training
NanoBioMedical Centre, Adam Mickiewicz University, Poznan, Poland	04.02.2019 15.02.2019	12	- chemical bath deposition of Polydopamine (PDA) over zinc oxide nanowires (ZnONWs): - influence of deposition time (1, 1.5, 2, and 3 hours) - influence of PDA concentration at fixed time (1 hour) (6 different concentrations) - characterization of structural properties of the prepared nanostructures by TEM, XRD, and Raman spectroscopy technique

Mobility

Host institution	Date	Duration (days)	Training
European Institute of Membranes at University of Montpellier Montpellier, France	21.04.2019 28.04.2019	8	- polyacrylonitrile (PAN) nanofibers by utilizing electrospinning set up were prepared; - metal oxide nanolayers (ZnO, Al_2O_3/ZnO) with different thickness (10, 20, and 50 nm) on Silicon/Polystyrene spheres (PSS (Ø 1 µm)) and glass/PSS substrates by atomic layer deposition (ALD) method were produced: - Si/PSS/ZnO and glass/PSS/ZnO (10, 20, and 50 nm); - PAN/Al_2O_3/ZnO (total thickness of deposition 20 nm: 10/10, 5/5, 2.5/2.5, 1/1, 0.5/0.5 nm)

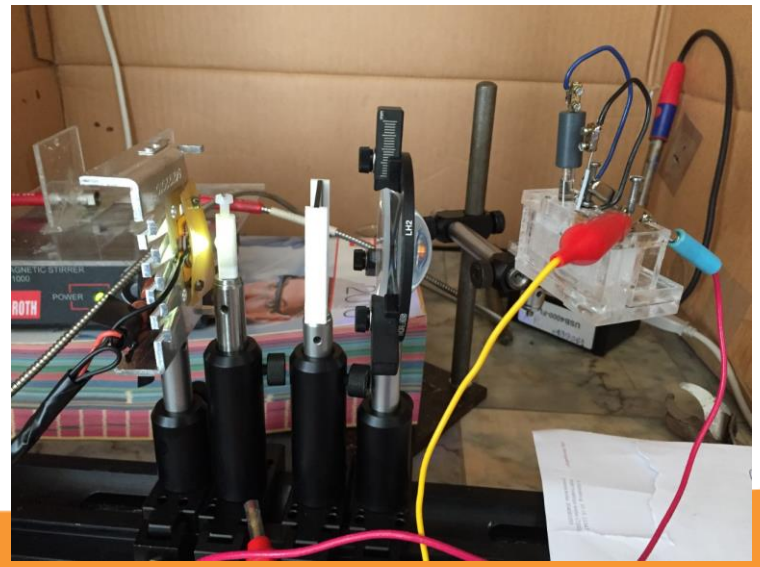






Mobility

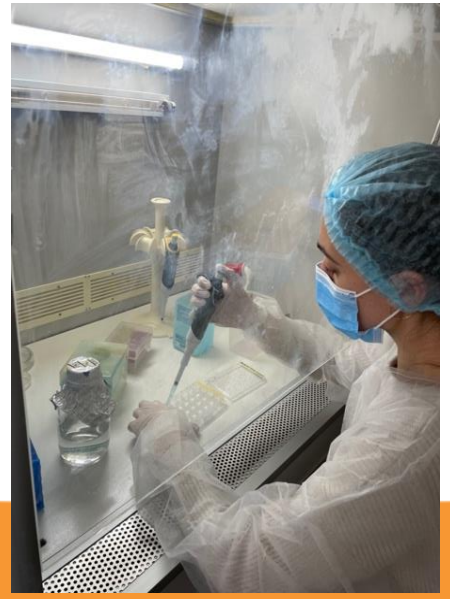
Host institution	Date	Duration (days)	Training
Vilnius University, Faculty of Chemistry and Geosciences Vilnius, Lithuania	08.06.2020 12.06.2020	5	Electrochemical characterization of ZnO-PDA on FTO glass by impedance spectroscopy was investigated. The measurements were done at different potentials (0, -0.45, - 0.3, 0.3, 0.45, and 0.8 V) with and without light. The photoelectrochemical effects were investigated. As well, measurements of Raman spectroscopy of modified ZnO-PDA nanostructures were done. The obtained data will be analyzed and used for publication in further.



PostDoc Latvia

Mobility

Host institution	Date	Duration (days)	Training
Sumy State University Sumy, Ukraine	06.01.2021 - 06.03.2021	60	The investigation of antibodies immobilization (anti-Rabbit IgG (H+L) Cross-Adsorbed Secondary Antibody, Alexa Fluor 488) on 5 types of samples: glass substrates with ZnO-PDA coating after different pretreatment (annealing, O_2 plasma treatment), and ZnO-PDA-PEI coating (with/without O_2 plasma pretreatment) were performed by using fluorescence microscopy. The study was done for the samples with and without Glutaraldehyde treatment (at 50 C for around 20 h). *Spectro-photometer Thermo Scientific Multiskan FC* was used for optical density measurements (the 2nd and 4th day after adding resazurin to our samples with cells). After, these data will be used for reduction coefficient calculation.



Mobility

Host institution	Date	Duration (days)	Training
Materials Research Center Kyiv, Ukraine	22.07.2021 - 21.09.2021	62	MXene synthesis technology was performed. Inroduction to fabrication protocol and set up.

Publicity 2019

- ✓ 06.02.2019 - Meeting with Artūras Belickas, a representative of UAB MONO Spektra in the Baltics, on a prototype of optical devices for sensor applications (LU ASI room 628, Jelgavas Street 3, Riga).

- ✓ 14.02.2019 - "Scientific afternoon" (LU Science House, 6th floor, room 650) - "Optical biosensors - what it is and why we study them", LU Faculty of Chemistry prof. Artūrs Vīksna, (Dr.) Viktoriia Holubnycha and (Dr.) Viktoriia Korniienko from SUMY State University.

Publicity 2019

- ✓ 02.05.2019 - Report presentation of the 1st quarter of the Postdoc project at ASI seminar (LU ASI, Jelgavas Street 3, Riga).

- ✓ 17.05.2019 - LU New Technology and Innovation Day, (laboratory demonstrations)

- ✓ 27.09.2019 - European Scientists' Night - LU Academic Center Science House, Jelgavas Street 3, Institute of Atomic Physics and Spectroscopy.

- ✓ 19.12.2019 – ASI seminar . Oral presentation of the latest results of the 1st year of postdoctoral project.

PostDoc Latvia

Publicity 2020

Fraunhofer IKTS

Fraunhofer Institute for Ceramic Technologies and Systems IKTS

Director
Prof. Dr. rer. nat. habil. Alexander Michaelis
Deputy directors
Dr.-Ing. Michael Zins
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Dresden, October 21, 2020

Fraunhofer IKTS | Maria-Reiche-Strasse 2 | 01109 Dresden | Germany

Dr. Roman Viter
Institute of Atomic Physics and Spectroscopy,
University of Latvia
19 Raina Blvd., Riga
LV 1586, Latvia
Phone: +371-200-58-754
Email: roman.viter@lu.lv

Confirmation letter

Dear Dr. Roman Viter,
Dear Dr. Viktoriia Fedorenko,

Hereby I confirm your participation on our department seminar on May 29th 2020 with the following presentations:

Dr. Roman Viter: ***Photoluminescence metal oxide nanostructures as sensor and biosensor platforms***

Dr. Viktoriia Fedorenko: ***Structural and optical properties of ZnO-polydopamine nanostructures.***

Thank you again for the very interesting talks!

I am looking forward to collaborating with you soon!

Kind regards

Natalia Beshchasna
Digital unterschrieben von Natalia Beshchasna
Datum: 2020.10.21 17:20:01 +02'00'

Dr. Natalia Beshchasna

Head of Group Biodegradation and Nanofunctionalization at Fraunhofer IKTS

- ✓ 06.05.2020 - Online seminar "Biotechnology and Medicine" took place within the cycle "Scientific Afternoon" (Zoom platform). Invited speaker is Maksym Pogorielov (Ukraine, Sumy State University).
- ✓ 29.05.2020 - Seminar (Microsoft team platform) organized by Fraunhofer ICT Department of Bio and Nanotechnology.
- ✓ 08.10.2020 – ASI seminar. Oral presentation of the latest results of the 2nd year of postdoctoral project.

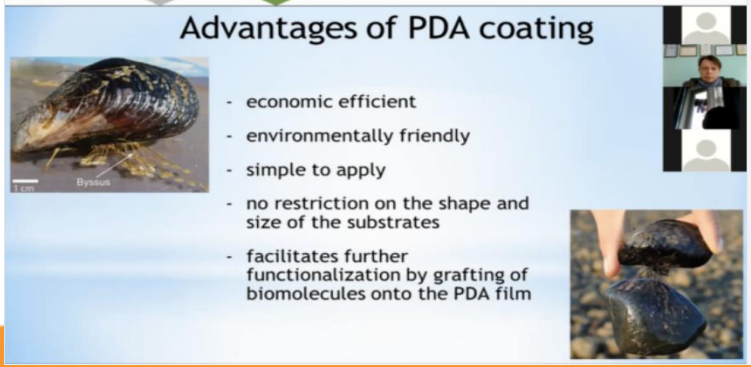
LU Atomfizikas un spektroskopijas institūts
7 мая ·

Jau otrā "Zinātnes pēcpusdiena" ir aizvadīta, kura šoreiz notika tiešsaistē! 💻 Paldies visiem apmeklētājiem par interesi un, protams, paldies Dr. Viktoriia Fedorenko (LU ASI Optisko biosensoru un funkcionālo nanomateriālu laboratorija) un vieslektoram Maksym Pogorielov (Ukraina, Sumy Valsts universitāte) par informatīvo stāstījumu un idejām par Polidopamīna (PDA) medicīnisko pielietojumu! 🔬

📺Tiešsaistes semināra "Biotehnoloģijas un medicīna" ierakstu iespējams noskatīties: https://universityoflatvia387-my.sharepoint.com/:v:/g/personal/af15019_edu_lu_lv/ETIH2LYV9ZJKkqv_gpr2EncB1rTKtAmXDNgiC5t4AkX4_Q?e=w7Gzna

Seminārs notika ERAF projekta "Fotoinducēto procesu pētīšana vienas dimensijas ZnO/polidopamīna nanostruktūrās" (Līg.Nr. 1.1.1.2/VIAA/2/18/279) ietvaros.

Показать перевод



PostDoc Latvia

Publicity 2020-2021

- ✓ 18.09.2020 - Laboratory demonstration for students
- ✓ 23.10.2020 - Meeting with local industry, representatives of LLU LF (Ina Alsiņa un Rihards Berķis)
- ✓ 30.04.2021 - participation with the virtual poster "European Scientists' Night 2021" (online format www.zinatniekunaktslv)

PostDoc Latvia

Projekta "**Fotoinducēto procesu pētīšana vienas dimensijas ZnO/polidopamīna nanostruktūras**"
Līg. Nr.1.1.1.2/VIAA/2/18/279 ietvaros sanāksme ar LLU LF ar pārstāvjiem Ina Alsiņa un Rihards Berķis par iespējamo sadarbību nākotnē.

Datums: 23.10.2020. plksts. 10:00 LU ASI 725. telpā Jelgavas ielā 3, Rīga

Nr.p.k.	Vārds, Uzvārds	Pārstāvētā organizācija	Paraksts
1	Roman Viter	ASI LU	
2	Ina Alsiņa	LLU LF	
3	Daina Damberga	LU ASI	
4	Rihards Berķis	LU ASI	
5	Ulises Miranda Ordonez	LU ASI	
6	Rihards Berķis	LLU LF	
7	Kristīne Grundšteine	LU ASI	
8	Viktoriia Fedorenko	LU ASI	
9			
10			

Investigation of photoinduced processes in one-dimensional ZnO / polidopamine nanostructures

Viktoriia Fedorenko[1], Daina Damberga[1], Igor Iatsunskyi[1], Emerson Coy[2], Radosław Mrówczyński[2], Roman Viter[1]

[1]*Institute of Atomic Physics and Spectroscopy, University of Latvia, Jelgavas 3, Riga, Latvia, LV-1050*

[2]*NanoBioMedical Centre, Adam Mickiewicz University, 3 Wszechnicy Piastowskiej str., 61-614, Poznan, Poland*

Introduction

Development of polydopamine (PDA) based composite nanomaterials is an actual subject. PDA is a biocompatible synthetic polymer, which has strong affinity to a wide range of surfaces due to the existence of multiple functional groups (such as indole, catechol, quinone, and indolic/catecholic π-system), which can be attached to organic and inorganic materials. Among a number of different inorganic functional materials, ZnO is well known and interesting due to its structure (different architectures i.e. nanoparticles, nanowires, etc.), electrochemical (high isoelectric point (IEP) (pH~9.1)) and optical properties (high exciton binding energy and high PL at room temperature).
The combination of ZnO with PDA layers could improve optical, electronic and sensitive properties of ZnO/PDA towards target molecules.

Figure 1. Setup for electrochemical measurements: 1 – potentiostat, 2 – light source (LED), 3 – quartz lenses, 4 – filter, 5 – electrochemical cell with three

Figure 2. SEM and TEM images of ZnO-PDA nanorods

Figure 3. Raman spectra of ZnO and ZnO-PDA composite

Figure 4. Cyclic voltammograms of glass/FTO/ZnO and glass/FTO/ZnO-PDA/GOx electrodes in absence of glucose and glass/FTO/ZnO-PDA/GOx in the presence of glucose: A) C-V measurements in dark conditions; B) C-V measurements in under UV excitation.

Figure 5. Calibration curve of sensor response vs. glucose concentration.

Conclusions

In conclusion, we can make following statements about interaction between biomolecules and the ZnO-PDA surface:

- Adsorbed molecules influenced electrochemical response of ZnO-PDA nanostructures.
- Decrease of current resulted from new layer of GOx, formed on the ZnO-PDA surface.
- Due to interaction between glucose and glucose oxidase resulted in increase of electrochemical signal.
- Chronoamperometry method was applied to test sensor towards glucose. Fast response (1 s), stable signal was obtained in the range of 0.0032 mM of glucose.

Projekts tiek īstenots Eiropas Reģionālās attīstības fonda projekta Nr.1.1.1.2/VIAA/2/18/279 vienošanās par inovācijās balstītu projektu Nr.1.1.1.5/20/A/002 un PostDoc projekta Līg.Nr.: 1.1.1.2/VIAA/2/18/279 ietvaros.

Submitted projects

#	Projekta nosaukums	Projekta nosaukums (eng)	Projekta numurs / Number	Projekta status / Status
1.	Jauni optiskie sensori aflatoksīna B1 noteikšanai	Novel optical sensors for Aflatoxin B1 detection	Izp-2020/2-0217	Noraidīts
2.	Jauni optiskie imunosensori lauksaimniecības vīrusu un vīrusveidīgo daļiņu reģistrēšanai	Novel optical immunosensors for detection of agriculture viruses and virus like particles	Izp-2019/1-0095	Noraidīts
3.	Jaunu metožu izstrāde augu vīrusu un vīrusiem līdzīgo nanodaļiņu noteikšanai, izmantojot fotoniskās nanostruktūras	Development of new methods for detection of plant viruses and virus-like nanoparticles by use of photonic nanostructures	Izp-2020/1-0148	Noraidīts

Topic	HORIZON-MSCA-2021-DN-01-01	Type of Action	HORIZON-TMA-MSCA-DN
Call	HORIZON-MSCA-2021-DN-01	Type of Model Grant Agreement	HORIZON-AG-UN

Acronym AVANT

Proposal title ADVANCED APPLICATIONS OF LASER MICRO AND NANOTEXTURING

Proposal number: 101073189

Proposal acronym: AVANT

Type of Model Grant Agreement: HORIZON Unit Grant

Acronym TIREX

Proposal title Targeting melanoma PTT treatment with MXene-antibody complex

Proposal number: 101073477

Proposal acronym: TIREX

Type of Model Grant Agreement: HORIZON Unit Grant

Further activity

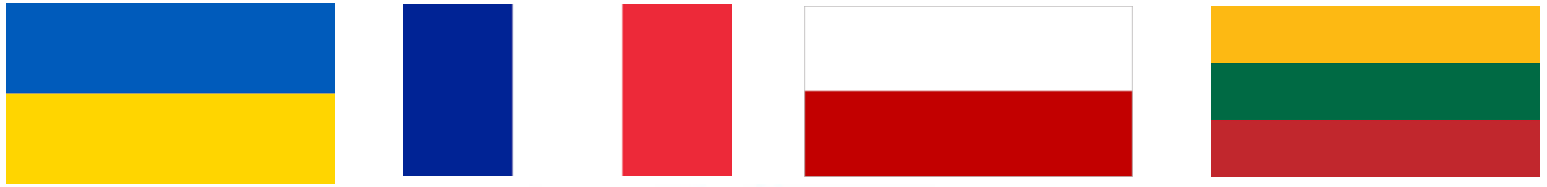
Project “Hybrid Biodegradable Coating for One-Wire Peripheral Nitinol Stent for Prevention of Restenosis and Plaque Formation (HybbiStent)” lig Nr. ES RTD/2021/19 LU registration Nr. ZD2021/21220 from 01.01.2022. until 31.05.2024.

PostDoc Latvia

Acknowledgments

Our team:

Our partners:



1. University of Latvia, Institute of Atomic Physics and Spectroscopy Riga, Latvia
2. State Research Institute Center for Physical Sciences and Technology, Vilnius, Lithuania
3. Sumy State University, Medical Institute, Sumy, Ukraine
4. NanoBioMedical Centre at Adam Mickiewicz University, Poznan, Poland
5. European Institute of Membranes (IEM) at University of Montpellier, Montpellier, France
6. Materials Research Centre, Kyiv, Ukraine

PostDoc Latvia

Thank you for your attention!
Paldies par jūsu uzmanību!

PostDoc Latvia