

CONFERENCE PROGRAM

MONDAY, 3 JUNE

8:00-9:30 Registration

CONFERENCE HALL

PLENARY LECTURES OF INVITED SPEAKERS

Chair Olena Vatazhuk

9:30-9:45 **BORIS VERKIN, PHYSICIST AND FOUNDER OF THE INSTITUTE FOR LOW TEMPERATURE PHYSICS AND ENGINEERING**

G.E. Grechnev

B.Verkin Institute for Low Temperature Physics and Engineering of NASU, Kharkiv, Ukraine

9:45-10:25 **PROBLEMS OF METHANE EXPLOSION AND BLAST ENERGY SUPPRESSION IN COAL MINES**

M. Chikhradze^{1,2}, E. Mataradze¹, K. Tavlalashvili¹, G. Janikashvili¹

¹*G.Tsulukidze Mining Institute, Tbilisi, Georgia,*

²*Georgian Technical University, Tbilisi, Georgia*

10:25-11:05 **OPTICAL SPECTROSCOPY OF EXCITONS WITH SPATIALLY SEPARATED ELECTRONS AND HOLES IN NANOHETEROSTRUCTURES WITH SEMICONDUCTOR AND DIELECTRIC QUANTUM DOTS**

S.I. Pokutnyi

Chuiko Institute of Surface Chemistry of NASU, Kyiv, Ukraine

11:05-11:25 *General Photo and Coffee Break*

CONFERENCE HALL

NANOPHYSICS AND NANOTECHNOLOGIES

Chair Maksym Barabashko

11:25-11:45 **THERMAL TRANSPORT IN MOLECULAR DISORDERED CRYSTALS WITH LONG RANGE ORDER**

D. Szewczyk

Institute of Low Temperature and Structure Research PAS, Wroclaw, Poland

11:45-12:00 **STRUCTURAL FEATURES OF POINT-CONTACT SENSORS BASED ON TETRACYANOQUINODIMETHANE COMPOUNDS**

D.O. Harbuz^{1,2}, A.P. Konotop², V.A. Gudimenko², A.P. Pospelov¹, G.V.Kamarchuk²

¹*National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine*

²*B. Verkin Institute for Low Temperature Physics and Engineering of NASU, Kharkiv, Ukraine*

12:00-12:20 **NOVEL PHENOMENA IN TWO-DIMENSIONAL MATERIALS: ELECTRICAL CONTROL OF INTERLAYER EXCITON DYNAMICS AND SIGNATURES OF SUPERCONDUCTIVITY IN ATOMICALLY THIN TWISTED HETEROSTRUCTURES**

K. Pistunova

Department of Physics, Stanford University, Stanford, California, USA

12:20-12:35 NONLINEAR DYNAMICS OF THE SPIN CHAIN WITH LONG-RANGE INTERACTION IN THE CONTINUUM LIMITP.V. Bondarenko, B.A. Ivanov*Institute of Magnetism of NASU and MES of Ukraine, Kyiv, Ukraine***12:35-12:50 MAGNETIC RESONANCE AND SHORT-RANGE MAGNETIC ORDER IN $\text{ErAl}_3(\text{BO}_3)_4$ CRYSTAL**S.N. Poperezhai¹, V.A. Bedarev¹, D.N. Merenkov¹, M.I. Kobets¹, A.A. Zvyagin¹, T. Zajarniuk², A. Szewczyk², M.U. Gutowska², I.A. Gudim³¹*B.Verkin Institute for Low Temperature Physics and Engineering of NASU, Kharkiv, Ukraine*²*Institute of Physics, Polish Academy of Sciences, Warsaw, Poland*³*Kirensky Institute of Physics, Krasnoyarsk, Russia***12:50-13:20****LAB TOUR****13:20-14:00****Time for Lunch**

CONFERENCE HALL

PLENARY LECTURES OF INVITED SPEAKERS

Chair *Sergii Poperezhai***14:00-14:40 GRAPHENE AND 2D MATERIALS FOR NEXT GENERATION PHOTONICS, OPTO-ELECTRONICS AND ELECTRONICS**A. Baldycheva*Centre for Graphene Science & Nano Engineering Science and Technology Group, College of Engineering, Mathematics and Physical Sciences, University of Exeter, UK***14:40-15:20 TAILORING CUSTOM POLARIZATION STATES**C. López-Mariscal^{1,2}¹*Department of Physics and Astronomy, Appalachian State University, Boone, NC, USA*²*Underwater Photonics, Cozumel, Mexico***15:20-15:30****OSA and SPIE Special Coffee Break**

CONFERENCE HALL

OPTICS, PHOTONICS AND OPTICAL SPECTROSCOPY

Chair *Sergii Poperezhai***15:30-15:45 PHOTOPHYSICS OF HALOGEN SUBSTITUTED ASYMMETRICAL PORPHYCENES AT THE LIQUID NITROGEN TEMPERATURE**A.Yu. Kharchenko, A. Listkowski, J. Waluk*Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland***15:45-16:00 OPTICAL SPECTROSCOPY AND POLARIZED LIGHT STUDY OF Co-BASED LAYER DOUBLE HYDROXIDES**I.M. Lukienko¹, R.Yu. Babkin², Yu.G. Pashkevich², Yu.M. Kharchenko¹, D. Wulferding³, P. Lemmens^{3,4}, D.E.L. Vieira⁵, A.N. Salak⁵¹*B.Verkin Institute for Low Temperature Physics and Engineering of NASU, Kharkiv, Ukraine*²*O. Galkin Donetsk Institute for Physics and Engineering of NASU, Kyiv, Ukraine*³*Laboratory for Emerging Nanometrology (LENA), TU Braunschweig, Braunschweig, Germany*⁴*Institute for Condensed Matter Physics, TU Braunschweig, Braunschweig, Germany*⁵*CICECO-Aveiro Institute of Materials, Department of Materials and Ceramics Engineering, University of Aveiro, Aveiro, Portugal*

- 16:00-16:15 LASER STIMULATED WHITE EMISSION PROCESSES IN TRANSPARENT Cr₃₊,Cr₄₊,Ca₂₊:YAG CERAMICS**
M. Chaika¹, R. Tomala¹, O.M. Vovk², R.P. Yavetskiy², W. Strek¹
¹*Institute for Low Temperatures and Structure Research PAS, Wroclaw, Poland*
²*STC "Institute for Single Crystals" of NASU, Kharkiv, Ukraine*
- 16:15-16:30 OPTICAL RESPONSE OF HOLLOW GOLD NANOPARTICLES**
L.N. Ilyashenko², N.P. Stognij¹, O.G. Nerukh¹
¹*Kharkiv National University of Radio Electronics, Kharkiv, Ukraine*
²*O.Ya. Usikov Institute for Radiophysics and Electronics of NASU, Kharkiv, Ukraine*
- 16:30-16:45 RESONANT ABSORPTION OF ELECTROMAGNETIC WAVES ACCOMPANIED BY EXCITATION OF LOCALIZED MODES WITH ANOMALOUS DISPERSION IN LAYERED SUPERCONDUCTORS**
S.S. Apostolov^{1,2}, M.V. Mazanov², Z.A. Maizelis^{1,2}, N.M. Makarov³,
A.A. Shmat'ko², V.A. Yampol'skii^{1,2}
¹*O.Ya. Usikov Institute for Radiophysics and Electronics NASU, Kharkiv, Ukraine*
²*V.N. Karazin Kharkiv National University, Kharkiv, Ukraine*
³*Benemérita Universidad Autónoma de Puebla, Puebla, Pue.México*
- 16:45-17:00 NUMERICAL SIMULATION OF EELS SPECTRA OF PLASMONIC NANODIMERS ACCOUNTING FOR SPATIAL DISPERSION EFFECTS WITH THE DISCRETE SOURCES METHOD**
I.V. Lopushenko
M.V. Lomonosov Moscow State University, Faculty of Physics, Moscow, Russia

STUDENT CLUB (OTAKARA YAROSHA 11)

IAPS ROUND TABLE

Chair *Nina Gamayunova*

18:00-19:00 IAPS Local Committee Kharkiv, the first student branch of the International association of physics students (IAPS) in Ukraine, presents the event for young scientists devoted to the 1st anniversary of IAPS LC Kharkiv.

Dr. Tetiana Rokhmanova, Active IAPS member in 2015-2018,

O.Ya. Usikov Institute for Radiophysics and Electronics of NASU, Kharkiv, Ukraine

"Discover physics world with IAPS. Experience of Individual membership"

Dr. Mariia Pashchenko

Institute of Physics, Czech Academy of Sciences, Praha, Czech Republic

The MSCA grant as external opportunities for PostDocs: work, study, collaborate, enjoy.

19:00-19:30

IAPS Special Coffee Break

STUDENT CLUB (OTAKARA YAROSHA 11)

OSA & SPIE YSW

Chair *Nataliia Mysko-Krutik*

19:30-20:30 ILTPE OSA (The Optical Society) and IRE SPIE (The International Society for Optics and Photonics) Student Chapters is organizing Young Scientists Workshop (YSW) devoted to the failures in scientific career development.

Prof. C. López-Mariscal, OSA Travelling Lecturer,

Department of Physics and Astronomy, Appalachian State University, Boone, NC, USA, and Underwater Photonics, Cozumel, Mexico

Ms. Anna Herus, President of ILTPE OSA SC

Mr. Volodymir Meleshko, President of IRE SPIE SC

OPTICAL RESPONSE OF HOLLOW GOLD NANOPARTICLES

L. N. Ilyashenko², N. P. Stognii¹, O. G. Nerukh¹

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In this work we study optical response of noble metal nanoparticles and report how it may be controllably varied over a wide range of wavelengths. The current intense interest in gold nanoparticles is due to their Surface Plasmon Resonances (SPR) that depend strongly on the shape and size [1] of the nanoparticles. As the SPR wavelength and resonantly enhanced absorption and scattering properties also depend on the dielectric medium in which gold nanoparticle is embedded, they are useful in testing for environmental contaminants, chemical and biological liquids. Among others, hollow nanoparticles have enhanced sensitivity due to the coupling of plasmonic fields on their external and internal surfaces. With purpose to select the most promising configurations in this work the scattering characteristics as functions of optical wavelength are investigated for various hollow Au nanoparticles in different surrounding solvents, to determine their sensitivity.

SPRs are identified as peaks in total scattering cross-section (Fig. 1), that is presented as a function on the excitation wavelength $\lambda \in [400\text{nm}, 700\text{nm}]$. It was found that SPR results in strongly enhanced absorption and scattering. For gold nanoparticles SPR falls in visible region of the electromagnetic spectrum, which is fundamental for their many color based applications. The effectiveness of plasmonic nanoparticles for each particular application depends strongly on their optical response at SPR, particularly:

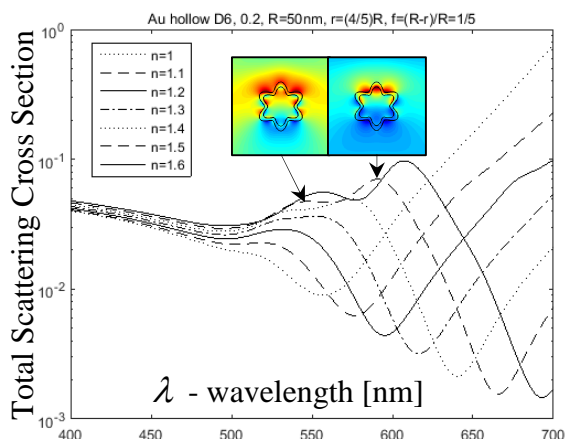


Fig. 1: Scattering cross-section as function on an excitation wavelength for hollow gold nanostars with $R = 50\text{ nm}$ (100 nm from tip to tip), illuminated by an electromagnetic plane wave along (0, -1) direction in various solvents $r = (4/5)R$.

nanoparticles, which can provide guidelines for a choice of their parameters to be used for new applications in biological sensing and imaging, medical diagnostics, drug development, photo-thermal therapy of cancer and bacterial infection.

- Scattered light makes it possible to identify the resonant wavelength almost precisely due to ability to distinguish the color of reflected light. Then LSPRs with enhanced scattering efficiency are useful for cell and biomedical imaging as well as other applications based on light scattering.

- LSPR is followed by the rapid conversion of the absorbed light into heat, which may be used for selective photothermal therapy of cancer and bacterial infections. Such applications may also require low scattering losses along with a high nanoparticle light absorption.

- Designing a nanoparticle with optimum absorption and optimum scattering may make a dual imaging/therapy approach possible.

The work is aimed at understanding relations between the sensitivity of nanoparticle [2] to the size of internal surface of the hollow Au

[1] S.K. Dondapati, T.K. Say, C. Hrelescu, T. A. Clar, F. D. Stefani, and J. Feldmann, *ACS Nano*, **4**, 6318-6322, (2010).

[2] P.K. Jain, and M. A. El-Sayed, *J. Phys. Chem. C*, **47**, 17452-17454, (2007).