Self-Assembled Plasmonic Nanoparticles for Organic Photovoltaics

Pastorelli, Francesco

Publication date: 2016

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Symposium EM7 : Functional Plasmonics

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Symposium Organizers
Laura Na Liu, Max Planck Institute for Intelligent Systems
Prashant K. Jain, University of Illinois - Urbana Champaign
Yongmin Liu, Northeastern University
Yuebing Zheng, Univ of Texas-Austin

EM7.9: Functional Plasmonics for Physics, Chemistry, Biology and Materials Science I

Session Chairs
Ralf Jungmann

Thursday AM, December 01, 2016
Hynes, Level 3, Ballroom A

8:30 AM - EM7.9.01
Actuation of Stimulus-Responsive Plasmonic Nanoparticles

David Ginger ¹

¹ University of Washington Seattle United States

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9:00 AM - EM7.9.02
Single-Molecule Surface-Enhanced Raman Measurements in Individual Hot Spots

Nam Hoon Kim ¹, Wooseup Hwang ², Kangkyun Baek ¹, Md. Rohman ¹, Jeehong Kim ², Gyeonwon Yun ¹, Martin Moskovits ⁴, Kimoon Kim ¹ ² ³

¹ Institute for Basic Science (IBS) Pohang Korea (the Republic of), ² Pohang University of Science and Technology Pohang Korea (the Republic of), ³ Division of Advanced Materials Science Pohang University of Science and Technology Pohang Korea (the Republic of)
9:15 AM - EM7.9.03
Measuring Viral Membrane Fluidity Based on the Scattered Light Polarization Fluctuations of Plasmonic Nanoparticle Labels

Amin Feizpour¹, Behnaz Eshaghi¹, Hisashi Akiyama¹, Suryaram Gummuluru¹, Bjoern Reinhard¹

¹ Boston University Boston United States

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9:30 AM - *EM7.9.04
Integration of Plasmonic Heating with Phase Transition for Novel Applications

Younan Xia¹

¹ Georgia Institute of Technology Atlanta United States

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10:00 AM -
BREAK

10:30 AM - *EM7.9.05
Super-Resolution Microscopy with DNA Molecules

Ralf Jungmann¹²

¹ Department of Physics and Center for Nanoscience Ludwig Maximilian University Munich Germany, ² Max Planck Institute of Biochemistry Munich Germany

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11:00 AM - EM7.9.06
Plasmonic Nanoparticle Networks Assembled from DNA Origami

Pengfei Wang²¹, Kai Guo³, Yoonjo Hwang³, Kyungjin Park³, Seungwoo Lee³, Yonggang Ke²¹

² Biomedical Engineering, School of Medicine Emory University Atlanta United States, ¹ Biomedical Engineering Georgia Institute and Technology Atlanta United States, ³ Sungkyunkwan University Suwon Korea (the Republic of)

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11:15 AM - EM7.9.07
Self-Assembled Plasmonic Nanoparticles for Organic Photovoltaics

Francesco Pastorelli ¹

¹ DTU Roskilde Denmark

Introducing plasmonic resonant scatterers in photovoltaic devices is a promising way to increase energy conversion efficiencies by trapping incoming light in ultra-thin solar cells. Colloidal plasmonic oligomers are obtained following a cost-effective self-assembly strategy and incorporated in organic-based cells produced using spin-coating techniques in ambient air conditions. An interesting increase is observed of both external quantum efficiency (EQE) and short-circuit current for solar cells loaded with plasmonic oligomers compared with reference organic cells with and without isolated gold nanoparticles. Theoretical calculations demonstrate that the wavelength-dependent EQE enhancement is a resonant process due to the increased scattering efficiency in plasmonic antennas allowed by a chemically controlled 1 nm nanogap. This method opens the way towards roll-to-roll fabrication of efficient plasmonic ultra-thin photovoltaic devices.

The nano-gap antennas are linked at a controlled distance of a few nanometers by Dithiothreitol molecules. The spacing molecules ensure a minimum distance that plays a fundamental role in the formation of intensity hot spots in the nanogap as well as large and red-shifted scattering peaks. This OPV device, realized in ambient air condition, exhibited an efficiency 14% higher than the reference one showing a relevant enhancement in the red part of the EQE measurements.

Francesco Pastorelli, Sebastien Bidault, Jordi Martorell, Nicolas Bonod, DOI: 10.1002/adom.201300363

11:30 AM - *EM7.9.08
Reconstructing Hydrogen-Induced Phase Transitions in Individual Nanocrystals

Andrea Baldi ¹, Tarun Narayan ², Ai Leen Koh ³, Robert Sinclair ², Jennifer Dionne ² ⁴


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**EM7.10: Functional Plasmonics for Physics, Chemistry, Biology and Materials Science II**

Session Chairs
Maximilian Urban
Thursday PM, December 01, 2016
Hynes, Level 3, Ballroom A

1:30 PM - *EM7.10.01
Colloidal Nanocrystals Absorbing in the NIR—Synthesis, Transformations and Applications

Liberato Manna

1 Inst Italiano di Tecnologia Genova Italy

Show Abstract

2:00 PM - EM7.10.02
 Preferential Methane Production from Photocatalytic Carbon Dioxide Hydrogenation on Plasmonic Rhodium Photocatalysts

Xiao Zhang, Henry Everitt, Jie Liu

1 Duke University Durham United States

Show Abstract

2:15 PM - *EM7.10.03
Programmable DNA Origami for Plasmonic Molecules, 2D Clusters and 2D Lattices

Pengfei Wang, Stavros Gaitanaros, Seungwoo Lee, Mark Bathe, William Shih, Yonggang Ke

1 Wallace H. Coulter Department of Biomedical Engineering Georgia Institute of Technology and Emory University Atlanta United States, 2 Department of Biomedical Engineering Massachusetts Institute of Technology Cambridge United States, 3 SKKU Advanced Institute of Nanotechnology and School of Chemical Engineering Sungkyunkwan University Suwon Korea (the Republic of), 4 Wyss Institute for Biologically Inspired Engineering Harvard University Boston United States, 5 Department of Cancer Biology, Dana-Farber Cancer Institute Harvard Medical School, Harvard University Boston United States, 6 Department of Biological Chemistry and Molecular Pharmacology Harvard Medical School, Harvard University Boston United States

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2:45 PM - EM7.10.04
Self-Assembly for Active Plasmonic Devices

Farnaz Niroui, Mayuran Saravanapavanantham, Timothy Swagger, Jeffrey Lang, Vladimir Bulovic

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3:00 PM -
BREAK

3:30 PM - *EM7.10.05
Tuning Localized Surface Plasmon Resonance in Metal Oxide Nanocrystals

Delia Milliron

1 Department of Chemical Engineering The University of Texas at Austin Austin United States

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4:00 PM - *EM7.10.06
3D DNA Plasmonics

Maximilian Urban, Na Liu

1 Max Planck Institute for Intelligent Systems Stuttgart Germany, 2 Kirchhoff Institute for Physics University of Heidelberg Heidelberg Germany

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4:30 PM - EM7.10.07
Plasmonic Nanopores for Single Molecule Sensing

Francesca Nicoli, Daniel Verschueren, Maxim Belkin, Aleksei Aksimentiev, Cees Dekker, Magnus Jonsson

2 Bionanoscience Delft University of Technology Delft Netherlands, 3 University of Illinois at Urbana-Champaign Urbana-Champaign United States, 1 Laboratory of Organic Electronics Linköping University Norrkoping Sweden

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EM7.11: Poster Session III: Functional Plasmonics
Session Chairs

Thursday PM, December 01, 2016
8:00 PM - EM7.11.03
Scanning-Free Near Field Optical Microscopy with Tunable Plasmonic Graphene Gratings

Sandeep Inampudi ¹, Jierong Cheng ¹, Hossein Mosallaei ¹

¹ Northeastern University Boston United States

Show Abstract

8:00 PM - EM7.11.08
Probing Charge Transfer Plasmons in Metallic Koch-Type Antennas across the Terahertz Domain

Arash Ahmadiyand ¹, Raju Sinha ¹, Mustafa Karabiyik ¹, Phani Kiran Vabbina ¹, Burak Gerislioglu ¹, Nezih Pala ¹

¹ Florida International University Miami United States

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8:00 PM - EM7.11.09
Formation of Metal Nanowire Array by Mechanical Deformation Using Anodic Porous Alumina Molds and Its Application to Plasmonic Devices

Toshiaki Kondo ¹, Takashi Yanagishita ¹, Hideki Masuda ¹

¹ Tokyo Metropolitan University Hachioji Japan

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8:00 PM - EM7.11.07
Gold Nanostars with Tunable Plasmonic Properties for Identification, Localization, and Quantification of Biologically-Relevant Targets

Ted Tsoulos ¹, Supriya Atta ¹, Manjari Bhamidipati ¹, Laura Fabris ¹

¹ Rutgers University Piscataway United States

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8:00 PM - EM7.11.19
Designing Shape of Plasmonic Nanoparticle through Organothiol Molecule for Unprecedented Optical Property
**Hye-Eun Lee**, **Hyo-Yong Ahn**, **Yoon Young Lee**, **Ki Tae Nam**

Materials Science and Engineering Seoul National University Seoul Korea (the Republic of)

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**8:00 PM - EM7.11.21**

Isolating the Plasmonic Properties of Non-Noble Copper Nanoparticles through Heterostructuring

**Derrick Mott**, **Shinya Maenosono**

Materials Science and Engineering Seoul National University Seoul Korea (the Republic of)

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**8:00 PM - EM7.11.02**

Broadband Light Absorption in Ultrathin Planar Metallic Films

**Artur Davoyan**, **Giulia Tagliabue**, **Harry Atwater**

Resnick Sustainability institute Pasadena United States, Kavli Nanoscience Institute Pasadena United States, California Institute of Technology Pasadena United States, Joint Center for Artificial Photosynthesis Pasadena United States

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**8:00 PM - EM7.11.01**

Effects of Metal Film Thickness and Gain on the Coupling of Organic Semiconductor Emission to Surface Plasmon Polaritons

**Ankur Dalsania**, **Jesse Kohl**, **Cindy Kumah**, **Zeqing Shen**, **Christopher Petoukhoff**, **Catrice Carter**, **Deirdre O'Carroll**

Department of Chemistry and Chemical Biology Rutgers University Piscataway United States, Department of Materials Science and Engineering Rutgers University Piscataway United States, Department of Chemical, Biochemical, and Environmental Engineering University of Maryland Baltimore United States, Institute for Advanced Materials Devices and Nanotechnology Rutgers University Piscataway United States

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**8:00 PM - EM7.11.04**
Optoelectronic Properties of Polymer Semiconductor Films Integrated with Plasmon-Upconversion Coupling

Yu Jin Jang¹, Eunah Kim¹, Sunghyun Ahn², Kyungwha Chung¹, Jihyeon Kim¹, Heejun Kim¹, Huan Wang¹, Yoon Hee Jang¹³, Jiseok Lee², Dong-Wook Kim¹, Dong Ha Kim¹

¹ EWHA Womans University SEOUL Korea (the Republic of), ² Ulsan National Institute of Science and Technology (UNIST) ULSAN Korea (the Republic of), ³ Korea Institute of Science and Technology (KIST) SEOUL Korea (the Republic of)

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8:00 PM - EM7.11.05
Symmetry Breaking, Facet Stability and Shape Control in Au Nanorod Growth

Joanne Etheridge¹, Wenming Tong¹, Michael Walsh¹, Hadas Katz-Boon¹, Alison Funston¹

¹ Monash Univ Clayton Australia

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8:00 PM - EM7.11.06
#xD; Plasmonic Induced Local Temperature Rise Measured by Upconversion Nanothermometry for Hyperthermia

Mengistie Debasu¹², Carlos Brites¹, Sangeetha Balabhadra¹, Helena Oliveira³, Joao Rocha², Luis Carlos¹

¹ Department of Physics and CICECO-Aveiro Institute of Materials University of Aveiro Aveiro Portugal, ² Departments of Chemistry and CICECO-Aveiro Institute of Materials University of Aveiro Aveiro Portugal, ³ Department of Biology and CESAM University of Aveiro Aveiro Portugal

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8:00 PM - EM7.11.24
Plasmon–Enhanced Whispering Gallery Mode Emission from Metal–Dielectric Core–Shell Resonator

Trong Ngo¹²³, Ching-Hang Chien¹²³, Yu-Da Chen¹²³, Yia-Chung Chang¹⁴

¹ Research Center for Applied Sciences Academia Sinica Taipei Taiwan, ² Nano Science and Technology Program, TIGP Academia Sinica Taipei Taiwan, ³ Department of Engineering and System Science Academia Sinica Taipei Taiwan, ⁴ Department of Physics National Cheng Kung University Tainan Taiwan
8:00 PM - EM7.11.15
Surface Plasmon Enhanced Molecular Beacons for Sensitive DNA Detection

Akash Kannegulla, Ye Liu, Li-Jing Cheng

1 Oregon State University Corvallis United States

8:00 PM - EM7.11.16
A Plasmonic Platform with Disordered Array of Metal Nanoparticles for Three-Order Enhanced Upconversion Luminescence and Highly-Sensitive Near-Infrared Photodetector

Seok Joon Kwon, Gi Yong Lee, Kinam Jung, Hyungduk Ko, Ho Seong Jang, Il Ki Han

1 Korea Institute of Science and Technology Seoul Korea (the Republic of)

8:00 PM - EM7.11.17
Microparticle Manipulation Using Thermoplasmmonic Marangoni Flow

Kyoko Namura, Kaoru Nakajima, Motofumi Suzuki

1 Kyoto University Kyoto Japan

8:00 PM - EM7.11.18
Sensing Performance of Hybrid Magnetoplasmonic Nanohole Arrays

Antonio Garcia-Martin, Blanca Caballero, Juan Carlos Cuevas

1 Intitute of Microelectronics of Madrid CSIC Tres Cantos Spain, 2 Departamento de Fisica Teorica de la Materia Condensada Universidad Autonoma de Madrid Cantoblanco - Madrid Spain

8:00 PM - EM7.11.20
Plasmonic Activation of Platinum Clusters for Photocatalysis
Sarah Wieghold ¹, Lea Nienhaus ², Fabian Knoller ¹, Florian Schweinberger ¹, Joseph Lyding ³, Ueli Heiz ¹, Martin Gruebele ³, Friedrich Esch ¹

¹ Technische Universität München Garching Germany, ² Massachusetts Institute of Technology Cambridge United States, ³ University of Illinois Urbana United States

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8:00 PM - EM7.11.27
Directed-Assembled Moiré Plasmonic Metasurfaces for Multi-Functional Biomedical Application

Zilong Wu ¹, Yuebing Zheng ¹

¹ University of Texas at Austin Austin United States

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8:00 PM - EM7.11.28
Deep-UV Plasmonics Based on Metal Nanoparticles and Resonant Mode Coupling

Koichi Okamoto ¹, Haruku Nishida ¹, Daisuke Tanaka ², Kouta Okura ¹, Kazutaka Tateishi ¹, Sou Ryuzaki ¹, Pangpang Wang ¹, Kaoru Tamada ¹

¹ Kyushu University FUKUOKA Japan, ² NIT Oita College Oita Japan

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8:00 PM - EM7.11.29
Localized Surface Plasmon Resonances in Fully-Encapsulated Aluminium NanoVoids

Ye Zhu ¹, Philip Nakasima ¹, Alison Funston ², Laure Bourgeois ¹, Joanne Etheridge ¹ ³

¹ Materials Science and Engineering Monash University Clayton Australia, ² School of Chemistry Monash University Clayton Australia, ³ Monash Centre for Electron Microscopy Monash University Clayton Australia

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8:00 PM - EM7.11.30
Selective Excitation of Individual Multipolar Resonances in Single Core (Dielectric)-Satellite (Metal) Structures

Tian-Song Deng ¹, U. Manna ², J.H. Lee ¹, J. Parker ² ³, N. Shepherd ¹ ², Y. Weizmann ¹, N. F. Scherer ¹ ²
1 Department of Chemistry University of Chicago Chicago United States, 2 James Franck Institute University of Chicago Chicago United States, 3 Department of Physics University of Chicago United States

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8:00 PM - EM7.11.31
CMOS-Compatible Zero-Index Metamaterial

Yang Li 1, Daryl Vulis 1, Orad Reshef 1, Philip Camayd-Munoz 1, Mei Yin 1, Shota Kita 1, Marko Loncar 1, Eric Mazur 1

1 Harvard University Cambridge United States

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8:00 PM - EM7.11.32
Fabrication of Plasmonic Biomimic Substrates

Anatoliy Pinchuk 1

1 University of Colorado at Colorado Springs Colorado Springs United States

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8:00 PM - EM7.11.25
Tunable Plasmonic Metamaterials through Geometric Tuning

Jeremy Reeves 1, Thomas Stark 1, Lawrence Barrett 1, Richard Lally 1, David Bishop 1

1 Boston University Boston United States

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8:00 PM - EM7.11.23
Hybrid Plasmonic Cavity Design for THz Generation

Qiang Liu 1,2, Sacharia Albin 3, Zhengbiao Ouyang 1,2, Suling Shen 4

1 College of Electronic Science and Technology of Shenzhen University Shenzhen China, 2 THz Technical Research Center of Shenzhen University Shenzhen China, 3 Engineering Department, Norfolk State University Norfolk United States, 4 Department of Electronic Engineering, The Chinese University of Hong Kong Hong Kong

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8:00 PM - EM7.11.33
Angle-Dependant Broadband Reflectance of Direct Laser Fabricated Plasmonic Nanoparticle Templates on Silica of Varying Thickness

Jacob Spear 1, Dimitris Bellas 2, D Fairhurst 1, Nikolaos Kalfagiannis 1, Elefterios Lidorikis 2, D. Koutsogeorgis 1

1 Nottingham Trent University Nottingham United Kingdom, 2 Department of Materials Science and Engineering University of Ioannina Ioannina Greece

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8:00 PM - EM7.11.10
High Responsivity Infrared Graphene-Based Photodetector Assisted by Plasmonic Effect

Chen Zefeng 1

1 CUHK Hong Kong China

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8:00 PM - EM7.11.11
Fabrication of Wafer-Scale Uniform Surface Enhanced Raman Scattering (SERS) Substrates for Quantitative Bio Sensing

Daejong Yang 1, Hyunjun Cho 1, Madelyn Wang 1, Kelly Woo 1, Sagar Vaidyanathan 1, Hyuck Choo 1

1 California Institute of Technology Pasadena United States

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8:00 PM - EM7.11.12
From Weak to Ultrastrong Light-Matter Coupling in (6,5) Carbon Nanotubes and Plasmonic Crystals

Yuriy Zakharko 1, Arko Graf 1, Jana Zaumseil 1

1 University of Heidelberg Heidelberg Germany

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8:00 PM - EM7.11.13
Silver Plasmonic Nanofluids for Solution Processed Solar Cells

Spyridon Kassavetis\textsuperscript{1,2}, Christos Kapnopoulos\textsuperscript{1}, Panos Patsalas\textsuperscript{1}, Elefterios Lidorikis\textsuperscript{2}, Stergios Logothetidis\textsuperscript{1}

\textsuperscript{1} Physics Department Aristotle University of Thessaloniki Thessaloniki Greece, \textsuperscript{2} Materials Science and Engineering University of Ioannina Ioannina Greece

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8:00 PM - EM7.11.14
Focusing of THz Waves Using Silicon-Based Hyperbolic Metamaterials

Akash Kannegulla\textsuperscript{1}, Li-Jing Cheng\textsuperscript{1}

\textsuperscript{1} Oregon State University Corvallis United States

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8:00 PM - EM7.11.34
Engineered Core-Shell Nanostructures for Plasmon Enhanced Difference Frequency Generation in Terahertz Range

Raju Sinha\textsuperscript{1}, Arash Ahmadivand\textsuperscript{1}, Phani Kiran Vabbina\textsuperscript{1}, Mustafa Karabiyik\textsuperscript{1}, Burak Gerislioglu\textsuperscript{1}, Nezih Pala\textsuperscript{1}

\textsuperscript{1} FIU Miami United States

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8:00 PM - EM7.11.26
Synthesis of Plasmonics Saturn-Like Particles

Mai Desouky\textsuperscript{1}, Hanbin Zheng\textsuperscript{1}, Serge Ravaine\textsuperscript{1}

\textsuperscript{1} Chemistry University of Bordeaux Bordeaux France

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