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Plasmonics: Metallic Nanostructures and Their Optical Properties XIII

Allan D. Boardman
Din Ping Tsai
Editors

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Introduction

This proceedings contains papers presented at the 2015 SPIE Optics & Photonics Conference: "Plasmonics: Metallic Nanostructures and Their Optical Properties XIII," held in San Diego, California, 9-13 August 2015. The aim of this conference was to bring specialists together from diverse research areas, provide a forum for the exchange of information on the latest progress of plasmonics, accelerate their applications, and look at the directions in which research in this field is leading us.

The conference and proceedings have been divided into 18 sessions. In the first session, the papers are related to the fundamentals of surface plasmon. Topics include: transverse spin of surface plasmon polaritons and spin-orbit coupling effects in light scattering by plasmonic nanostructures; generation of quantum entangled states in nonlinear plasmonic structures and metamaterials; efficient far-field transmission of orbital angular momentum light states; and magneto-optical response of a periodic metallic nano-structure.

The second session is about the fundamentals of surface plasmon as well, including: perfect optical imaging of a Veselago lens: Eigenstate based analysis; beam engineering for selective and enhanced coupling to multipolar resonances; ultrafast coherent dynamics of Rydberg electrons bound in the image potential near a single metallic nanoobject; and heat generation, hot electrons, and transparency windows in plasmonic nanostructures.

The third session focuses on plasmonic applications. Here, participants report on: thermal phenomena in quantum plasmonics, plasmonic laser sensors, and near-field imaging and spectroscopy of hybridized plasmons.

The fourth session deals with surface plasmon related measurement. Topics primarily involve ultrafast nanoelectronics, such as: steering electrons in infrared near-fields; mapping near-field plasmonic interactions of silver particles with scanning near-field optical microscope measurements; probing plasmonic hot spots on single gold nanowires using combined near field techniques; ultrafast dynamics via coherent exciton-plasmon coupling in quantum dot-metallic nanoparticle systems; and time-resolved propagation and interferometric lensing of surface plasmons were presented.

The fifth session also focuses on plasmonic applications, such as: multicolor fluorescence microscopic imaging of cancer cells on the plasmonic chip; NIR and MIR charge transfer plasmons in wire-bridged antennas; nanoporous antennae for high quality factor infrared sensing; plasmonic holography: obtaining wide angle, broadband, and high efficiency; and tuning plasmonic cavity modes by the symmetry breaking of metasurface.

The sixth session is on plasmonic coupling and nonlinearity, including: strongly coupled plasmon-nanocavity modes for broadband; near-field induced absorption in ultrathin semiconductor coatings; cooperative energy transfer in plasmonic systems; surface plasmon strengthened nonlinearity in indium-tin-oxide coated Cu-doped potassium sodium barium strontium niobate crystals; enhancing second-order nonlinearity on Au-nanorods at localized surface plasmon resonance with nonlinear optical polymers; and a comparative study of second-harmonic generation in plasmonic and dielectric gratings made of centrosymmetric materials.

The seventh session is devoted to radiation engineering, including: surface-enhanced Raman spectroscopy on engineered plasmonic metamaterials for "label free" biosensing; surface plasmon polaritons mediated energy transfer in stratified metal- dielectric nanostructure; integrated ring grating-nanoantenna structure for plasmon/emitter coupling; fluorescence enhancement using Fano-resonant, a plasmonic nanostructure with selective functionalization of molecules at the electromagnetic hot spot; plasmon enhanced linear and nonlinear photoluminescence in planar nanoparticle arrays; and probing and controlling large Purcell enhancement in plasmonic nanoantennas.

The eighth session is also related to plasmonic coupling and nonlinearity, focusing on: second harmonic excitation spectroscopy in studies of Fano-type coupling in plasmonic arrays; predicting nonlinear properties of metamaterials from the linear response; multi-coupled resonant splitting with a nano-slot metasurface and PMMA phonons; local field enhanced second-harmonic response of organic nanofibers; and plasmonic coupling of gold curvilinear nanorods with nanogap were presented.

The ninth session is concerned with novel material for plasmonics and looks at graphene plasmonics. Topics include: multiple sharp Fano resonances in silver split concentric nanoring resonator dimers on a metasurface; graphene's support of the manipulating mode propagation in the hybird plasmonic nanowaveguides; observation of Fano resonances in highly doped semiconductors plasmonic resonators; and alloyed thin-films and nanostructures with dielectric function on demand.

The tenth session is for plasmonic applications. Authors report on: plasmonics for the industry; optical dark field and electron energy loss imaging and spectroscopy of symmetry-forbidden modes in loaded nanogap antennas; epitaxial silver as a plasmonic materials platform: from plasmonic nanolasers to long range plasmonic wave propagations; femtosecond control of magneto-optical effects in magnetoplasmonic crystals; a plasmonic walker; and light modulation to far-field excitation of graphene plasmons: science and applications of graphene-integrated metasurfaces.

The eleventh session is also about plasmonic applications. We have papers on: surface plasmon resonance gas sensing by electrons injection; comparison between plasmonic and dielectric nanoantennas for surface-enhanced spectroscopies; wafer-scale plasmonic and photonic crystal sensors; hot electron pump: a plasmonic rectifying antenna; and tunable optical extinction of nano-antennas for solar energy conversion from near-infrared to visible.

The twelfth session is for plasmonic nanostructures and nanofabrication, which includes: angled nanospherical-lens lithography as a high-throughput method to fabricate various nanodisk cluster arrays; 3D chiral nanoplasmonics: fabrication, chiroptic engineering, mechanism, and application in enantioselection; modeling and engineering of three-dimensional chiroplasmonic silver nano structures; twisted nanosphere lithography: use colloidal Moiré patterns as masks; and nanoparticles to nanostructures for plasmonic-related applications.

The thirteenth session focuses on plasmon control. Topics involve: perfect light trapping in mid-IR using patterned ZnO structures; terahertz metal grid polarizer with bridges on quartz substrate; optical force acting on metallic nanostructure; and electrothermoplasmonic flow for plasmon-assisted optical trapping.

The fourteenth session is for fundamentals of surface plasmons papers on: non-quasi-static eigenstates of Maxwell's equations in a two-constituent composite medium and their application to a calculation of the local electric field of an oscillating electric dipole; retrieving the polarizability tensor of wire media; distinguishing between plasmon-induced and photoexcited carriers in a device geometry; and taming surface plasmons with adjacent molecules.

The fifteenth session deals with plasmonic applications, including: imaging metallic nanostructures with second and third order nonlinear optical response; interfacing ion-exchanged waveguide for the efficient excitation of surface plasmons; controlling light scattering and emission at subwavelength scale with plasmonic nanopatch antennas; controlling the ultrafast hot electron dynamics in hybrid plasmonic nanostructures; resonant elements contactless coupled to bolometric micro-stripes; and hybridization models of gold nanoantennas arrays in polarization dependent evanescent waves.

The sixteenth session is also devoted to plasmonic applications, such as detecting single DNA molecule interactions with optical microcavities, impedance-matching analysis in IR leaky-wave antennas, and infrared surface phonon polariton waveguides on SiC substrate.

The seventeenth session focuses on metamaterial. We have papers on broadband toroidal response in three-dimensional plasmonic metamaterial, low-cost and high-throughput realization of metasurface-based absorber/ emitter for thermal-photovoltaic cells, and structured light-matter interactions in optical nanostructures.

In the final, eighteenth session is concerned with active control, which involves: on chip integration and light-matter interactions in active plasmonic devices; optical switching of nematic liquid crystal film arising from induced electric field of localized surface plasmon resonance; TCO/metal hybrid structures for surface plasmon enhanced light emitting in the near infrared range; optics and nonlinear buckling mechanics in large-area; highly stretchable arrays of plasmonic nanostructures; and exploiting local light helicity to direct emission.

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