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Plasmonics: Nanoimaging, Nanofabrication, and Their Applications III

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Introduction

These proceedings contain papers presented at the 2007 SPIE Optics & Photonics Conference Plasmonics: Nanoimaging, Nanofabrication, and Their Applications III, held in San Diego, California, 28–30 August 2007. The aim of the conference was to bring together specialists from diverse research areas and to provide a forum for the exchange of information on the latest progress of plasmonics, to accelerate their applications and to look at the directions in which research in this field is leading us.

The conference and proceedings have been divided into nine sessions. In the first session, papers are related to nanofabrication and nanolithography, such as focusing and manipulation of surface plasmon polaritons by laser fabricated dielectric structures, DNA-mediated patterning of gold nanoparticles into discrete structures for modularity, write and erase, and structural switching.

The second session is nanoimaging including particle enhanced plasmonic NSOM, near field imaging of subwavelength plasmonic structures, imaging of optical field distributions and plasmon wavefunctions in metal nanoparticles, and a surface plasmon polariton phase microscope with a subwavelength grating structure. The third session is advanced plasmonics spectroscopy. Tip-enhanced near-field Raman spectroscopy applied to nano-composite materials, and investigation of the secondary structures for long oligonucleotides using attenuated-total-reflection nanoplasmon-enhanced Raman scattering effect were reported.

The fourth session deals with nanosensing. Localized surface plasmon (LSP) sensing platform for multifunctional biosensing applications, such as a sensitive optical fiber biosensor based on LSPs of gold nanoparticles can perform biosensing with a sample solution of less than 100 nL, and biosensing based on nonlinear optics, second-harmonic generation (SHG) were presented. The fifth session is the manipulation of plasmonic effect, especially physical hierarchy systems based on dipole-dipole interactions and angular spectrum representation of optical near-fields associated with energy dissipation processes which lead to functionality such as traceability of information was demonstrated theoretically, as well as the dependence of the extinction spectra for hole arrays in a silver film with different distance, shape, and arrangement patterns.

The sixth session, plasmonic metamaterials, included quasistatic effective medium theory of plasmonic nanostructures and magnifying superlens based on surface plasmon optics. An analytic effective medium theory of plasmonic metamaterials on electrostatic eigenfunctions of plasmon states was reported. The emphasis is on the sub-wavelength particles and metamaterials with unit cell much smaller than the optical wavelength. The theory covers plasmonic structures with

arbitrary degree of symmetry, from completely asymmetric (including chiral) structures to fully isotropic ones. Several examples of negative permittivity and negative permeability plasmonic metamaterials are used to illustrate the theory. Superlens imaging based on negative refractive index behavior of surface plasmon polaritons is described. The design of a magnifying superlens is based on two-dimensional plasmonic metamaterials consisting of alternating layers of positive and negative refractive index.

The seventh session is devoted to plasmonics, including high energy plasmon resonances of silver nanoparticles, function and fundamental processes of nano-optoelectronics devices, investigation of long-range surface plasmon polaritons gratings by complex mode matching method, and plasmonic modes in periodic metal nanoparticle structures. The eighth session is related to nanoplasmonic applications. Compensation of loss by optical gain in propagating surface plasmons was presented.

The last session is a poster session; plasmonic nano-kaleidoscope, plasmonic optical fiber biosensor for small sample volume, and variation of the confocal parameters of silver nano-superlens were reported.

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