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***Plasmonics: Design, Materials,
Fabrication, Characterization,
and Applications XIV***

**Satoshi Kawata
Din Ping Tsai**
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Contents

- vii *Authors*
ix *Conference Committee*
xiii *Introduction*

FUNDAMENTALS OF PLASMONICS I

- 9921 0D **Nonlinear scattering in plasmonic nanostructures (Invited Paper)** [9921-12]
9921 0E **General eigenstates of Maxwell's equations in a two-constituent composite medium and their application to a calculation of the local electric field in a flat-slab microstructure** [9921-13]

FUNDAMENTALS OF PLASMONICS II

- 9921 0J **Fabrication of deep-profile Al-doped ZnO one- and two-dimensional lattices as plasmonic elements (Invited Paper)** [9921-17]

NONLINEAR PLASMONICS I

- 9921 0W **New numerical methods for the design of efficient nonlinear plasmonic sources of light and nanosensors (Invited Paper)** [9921-31]
9921 0X **Characterization of multiphoton emission from aggregated gold nano particles** [9921-32]

ULTRAFAST PHENOMENON

- 9921 10 **Spatio-temporal imaging of surface plasmon polaritons in two photon photoemission microscopy (Invited Paper)** [9921-35]

PLASMONICS SENSING AND IMAGING II

- 9921 1A **Refractometers for different refractive index range by surface plasmon resonance sensors in multimode optical fibers with different metals** [9921-45]

NONLINEAR PLASMONICS II

- 9921 1H **Second-order nonlinearities of 2D periodic arrays of Au nanorods at surface plasmon resonances** [9921-53]

GRAPHENE AND DIELECTRICS PLASMONICS

- 9921 1M **Fine-tune the spectrum of indium-tin-oxide nanorod arrays in the visible range** [9921-58]

PLASMONICS APPLICATIONS II

- 9921 1X **Design of plasmonic near-field transducers in heat-assisted magnetic recording: 1D Fourier approach** [9921-69]
- 9921 1Z **Nanoscale tailored plasmonic material for optimum broadband solar harvesting** [9921-71]

POSTER SESSION

- 9921 22 **Strong coupling of gold dipolar nanoantennas by symmetry-breaking in evanescent wave** [9921-74]
- 9921 24 **Enhanced quality factor in silver nanotubes** [9921-76]
- 9921 25 **Surface-enhanced Raman scattering: effective optical constants for electric field modelling of nanostructured Ag films** [9921-77]
- 9921 27 **Fast and accurate detection of cancer cell using a versatile three-channel plasmonic sensor** [9921-80]
- 9921 29 **Numerical analysis for characterization of the gold nanorod mediated-plasmonic heating with temporary NIR laser radiation for superficial breast cancer therapy** [9921-82]
- 9921 2B **Absorption of harmonic light in plasmonic nanostructures** [9921-84]
- 9921 2F **Fano resonances based on nanoscale plasmonic structure** [9921-90]
- 9921 2H **Research of the applications of ITO in microwave-range surface plasmon waves** [9921-92]
- 9921 2P **Enhancement in device performance of hepta-layer coupled InGaAs quantum dot infrared detector by AuGe surface plasmons** [9921-100]
- 9921 2V **The design and analysis of a noble surface plasmon resonance-based pressure sensor** [9921-106]
- 9921 2Y **Tuning Fano resonances of graphene-based gratings** [9921-109]
- 9921 2Z **UV-visible transmission through nanohole arrays in aluminum and magnesium** [9921-110]

- 9921 30 **Plasmon spectra of binary Ag-Cu mixtures supported in mordenite** [9921-112]
- 9921 33 **Description of resonant processes in the dipole moment interaction** [9921-115]
- 9921 37 **Effect of distance-dependent plasmonic coupling between gold nanorods and silicon substrate on second harmonic generation** [9921-119]
- 9921 38 **Plasmonic transparent conductors** [9921-120]
- 9921 3B **Adaptive system able to switch between angular resolved SPR and SPR imaging** [9921-123]
- 9921 3E **Plasmon interactions kind Pearcey** [9921-126]

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Ahmadi, A. R., 27
Appusamy, Kanagasundar, 2Z
Bae, Ji Yong, 29
Bance, S., 1X
Bergman, David J., 0E
Bernasconi, G. D., 0W
Bianco, Giuseppe Valerio, 2Y
Black, Charles T., 38
Blair, Steve, 2Z
Bolorizadeh, M. A., 27
Bruno, Giovanni, 2Y
Buckanie, Niemma M., 10
Butet, J., 0W
Cennamo, N., 1A
Chaikina, Elena, 37
Chakrabarti, Subhananda, 2P
Chang, Ki Soo, 29
Chang, Robert P. H., 1M
Chavez, Marco, A., 24
Chen, Kuo-Ping, 22
Chu, Shi-Wei, 0D
Corso, Alain Jody, 1A, 3B
de Ceglia, Domenico, 2B, 2Y
de la Vega-Cobos, Armando, 24
De Los Santos García, S. I., 33, 3E
Diroll, Benjamin T., 1M
Donazzan, Alberto, 3B
D'Orazio, Antonella, 2Y
Eguchi, Akira, 0X
Escobedo, P. I., 24
Farhi, Asaf, 0E
Fernandez-Garcia, R., 1X
Fuentes, María E., 24
Gan, C. H., 1X
García Guzman, A., 33
García-Zárate, Marco A., 37
García, Raúl, 24
Gaspar Armenta, Jorge A., 24
Ghadi, Hemant J., 2P
Gibbs, W. E. Keith, 2Y
Grande, Marco, 2Y
Gu, Wenhua, 2H
Gubbins, M. A., 1X
Guo, Peijun, 1M
Guruswamy, Sivaraman, 2Z
Hardy, M. J., 1X
Hoseinian, M., 27
Jensen, Flemming, 0J
Jeong, Chan Bae, 29
Juodkazis, Saulius, 25
Kahl, Philip A., 10
Kawata, Y., 1H
Ketterson, John B., 1M
Khomenko, Anatoly V., 37
Kim, Geon-hee, 29
Kim, Youngsik, 0X
Kumar, Manish, 2V
Lai, Senfeng, 2H
Larsen, Pernille V., 0J
Lavrinenko, Andrei V., 0J
Li, Hui, 2F
Liapis, Andreas C., 38
López-Bastidas, Catalina, 30
Lu, Phat, 0X
Machorro, Roberto, 30
Makris, Andreas, 10
Malureanu, Radu, 0J
Mao, Jieying, 2Z
Mar, Mikkel D., 0J
Martin, O. J. F., 0W
Martínez Niconoff, G., 33, 3E
Martínez Vara, P., 3E
McClellan-Iltlen, Éadaoin, 1Z
Meyer zu Heringdorf, Frank J., 10
Milster, Tom D., 0X
Nam, Ki-Hwan, 29
Nápoles-Duarte, J. M., 24
Neira, A., 1X
Nihashi, S., 1H
Ono, A., 1H
Palodiya, Vikram, 2V
Pandey, Sushil Kumar, 2P
Pelizzo, María Guglielmina, 1A, 3B
Perera, M. Nilusha M. N., 25
Petranovskii, Vitalii P., 30
Podbiel, Daniel, 10
Raghuwanshi, Sanjeev K., 2V
Ramírez-Rodríguez, L. P., 24
Raß, Nicolai, 10
Rawool, Harshad, 2P
Rodríguez, Luz M., 24
Scalora, Michael, 2B, 2Y
Schaller, Richard D., 1M
Schmidt, Daniel, 25
Sfeir, Matthew Y., 38
Shkondin, Evgeniy, 0J
Smolentseva, Elena, 30
Stoddart, Paul R., 25

Sugita, A., 1H
Takayama, Osamu, 0J
Torres Rodríguez, M. A., 33, 3E
Tyagi, Lavi, 2P
Valencia-Caicedo, Cindy J., 37
Vargas Morales, M., 33, 3E
Vincenti, Maria A., 2B, 2Y
Wang, Yunshan, 2Z
Wu, Wen, 2H
Wu, Yongfeng, 2F
Yang, Jhen-Hong, 22
Yang, K.-Y., 0W
Yu, Changqiu, 2F
Yuan, Ping, 2F
Zapato-Chavez, Emiliano, 24
Zeni, L., 1A
Zerulla, Dominic, 1Z
Zhang, Yundong, 2F
Zuppella, Paola, 1A, 3B

Conference Committee

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Session Chairs

- 1 Novel Concepts of Plasmonics
Nicholas I. Smith, Osaka University (Japan)
- 2 Chiral Plasmonics
Takuo Tanaka, RIKEN Center for Advanced Photonics (Japan)
- 3 Molecular Plasmonics
Shi-Wei Chu, National Taiwan University (Taiwan)
- 4 Fundamentals of Plasmonics I
Chen-Bin Huang, National Tsing Hua University (Taiwan)
- 5 Fundamentals of Plasmonics II
Yun-Chorng Chang, Research Center for Applied Sciences - Academia Sinica (Taiwan)
- 6 Nanofabrication
Zouheir Sekkat, Moroccan Foundation for Advanced Science, Innovation and Research (Morocco)
- 7 Metamaterials and Metasurface I
Dangyuan Lei, The Hong Kong Polytechnic University (Hong Kong, China)
- 8 Nonlinear Plasmonics I
Yi-Jun Jen, National Taipei University of Technology (Taiwan)
- 9 Ultrafast Phenomenon
Cheng Hung Chu, Academia Sinica (Taiwan)
- 10 Plasmonics Sensing and Imaging I
Fabrice Vallee, University Claude Bernard Lyon 1 (France)
- 11 Plasmonics Sensing and Imaging II
Atsushi Taguchi, Osaka University (Japan)
- 12 Fundamentals of Plasmonics III
Yun-Chorng Chang, Research Center for Applied Sciences - Academia Sinica (Taiwan)

- 13 Nonlinear Plasmonics II
Dai-Sik Kim, Seoul National University (Korea, Republic of)
- 14 Graphene and Dielectrics Plasmonics
Toshiharu Saiki, Keio University (Japan)
- 15 Fundamentals of Plasmonics IV
Min-Hsiung Shih, Academia Sinica (Taiwan)
- 16 Plasmonics Applications I
Ai Qun Liu, Nanyang Technological University (Singapore)
- 17 Plasmonics Applications II
Shulin Sun, Fudan University (China)

Introduction

This proceedings volume contains papers presented at the 2016 SPIE Optics + Photonics conference on Plasmonics: Design, Materials, Fabrication, Characterization, and Applications XIV held 28 August–1 September 2016 in San Diego, California. 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 was divided into 17 sessions. In the first session, papers were related to novel concepts of plasmonics, such as catenary optical nano-structures, electrical tuning of an optical antenna, and 3D metamaterial absorber for attomole molecular detection.

The second session was chiral plasmonics as well, including plasmonic generators and angular momentum for light matter interactions, creation and application of surface plasmon vortices, extraordinary local angular momentum near metallic nanoparticles, and optical chirality in symmetrical plasmonic nanoparticles via geometrical transformation.

The third session was molecular plasmonics, transferring energy between molecules seven microns apart using surface plasmons and intracellular plasmonics by laser generation of nano-probes.

The fourth session dealt with fundamentals of plasmonics: strong coupling of dye molecules with surface plasmons and cavities; nonlinear scattering in plasmonic nanostructures; expanding the electric field in the eigenfunctions of the full Maxwell equations for a two-constituent composite medium with general external sources applied to a setup of a slab in a medium; high-precision Green's function FDTD based on nonstandard finite differences for photonics design; and characterization of solid-supported ultrathin films and molecular interactions using MP-SPR.

The fifth session was on fundamentals of plasmonics, such as engineering ultra-narrow plasmon resonances, fabrication of deep-profile AZO one- and two-dimensional lattices as plasmonic elements, and fano resonances arising from coupled surface plasmon polariton and waveguide modes.

The sixth session's topic was nanofabrication, including large-scale nanofabrication of periodic nanostructures using nanosphere-related techniques for applications in green technology; large-area arrays of gold nanostructures from azopolymer templates; ultrasonic spray coating as a scale-up technique for the deposition of hybrid magnetic-plasmonic nanocomposites; and surface

enhanced Raman scattering (SERS) based on entrapment of plasmonic nanoparticles using local heating induced surface bubbles.

The seventh session was devoted to metamaterials and metasurface, including optical coatings for metamaterials; de-magnifying hyperlens: experimental demonstration and potential applications; dependence of organic dyes PL-lifetime on distance from transverse positive and negative hyperbolic metamaterials; tunable metasurfaces and nanoantennas with liquid crystals; and dual channel fluorescence radiation engineering on nano-patterned plasmonic metasurface.

The eighth session was also related to nonlinear plasmonics, including localized surface plasmon enhanced and modulated nonlinear optical processes: second harmonic generation and upconversion emissions, new numerical methods for the design of efficient nonlinear plasmonic sources of light and nanosensors, and characterization of multiphoton emission from aggregated gold nano particles.

The ninth session was ultrafast phenomenon: ultrafast nonlinear plasmonic response of a single metal nano-object, nonlinear emission of electrons from plasmonic fields, direct measurements of the femtosecond dynamics of Tamm plasmon-polaritons, and probing carrier dynamics in wide-bandgap semiconductor-metal nanoparticle hybrids.

The tenth session was plasmonics sensing and imaging: plasmonic core-satellite assemblies with high stability and yield, near perfect light trapping in 2D metallic nano-trenches at oblique angle of incidence and its sensor application; and SERS-active substrate with nano-meso plasmonic architecture.

The eleventh session was also about plasmonics sensing and imaging. We had papers presented on near-field imaging and spectroscopy of plasmonic cavities, super-resolution optical nano imaging through transparent, on-a-chip plasmonic platform for the multiplexed quantitative detection of cancer biomarkers in serum, and refractometers for different refractive index range by surface plasmon resonance sensors in multimode optical fibers with different metals.

The twelfth session was fundamentals of plasmonics, which included resolving nanophotonic spectra with quasi-normal modes, optical response of noble metal alloys, understanding plasmonic materials and geometries: confinement versus propagation length, and non-plasmonic nanostructures for subwavelength nonlinear optics.

The thirteenth session was on nonlinear plasmonics: non-von Neumann computing using plasmon particles interacting with phase change materials, grains of plasmonic probe for efficient TERS, and second-order nonlinearities of 2D periodic arrays of Au nanorods at surface plasmon resonances.

The fourteenth session was graphene and dielectrics plasmonics papers on colossal terahertz nonlinearity of tunneling van der Waals gap; nonlinear graphene plasmonics; gallium-doped zinc oxide plasmonic nanostructures for mid-IR applications; infrared perfect absorbers and filters using doping tunable zinc oxide structures; and enhanced all-optical modulation of the visible spectrum with indoped indium oxide nanorod arrays.

The fifteenth session dealt with fundamentals of plasmonics, including manipulating the interface states between a photonic crystal and a metasurface, a new concept to design the high efficiency surface plasmon coupler, quantum interference of highly-dispersive surface plasmons, a library of planar plasmonic resonators, and shape matters: tuning plasmonic resonances in single nanoparticles and their arrays.

The sixteenth session was also devoted to plasmonics applications, such as liquid-phase tunable metasurfaces and light manipulation, high circular dichroism ultraviolet lasing from planar spiral metal-gallium-nitride nanowire cavity, the effect of Coulomb interaction on spacing conditions in small nanoparticles, and plasmonic hot carrier mediated photon upconversion in GaN/InGaN quantum wells.

The seventeenth session was also focused on plasmonics applications. We had papers presented on ultraviolet plasmonic nanolaser with hyperbolic metamaterial; design strategies for plasmonic near-field transducers in heat-assisted magnetic recording; 1D Fourier approach; selectively inducing optical magnetism; nanoscale tailored plasmonic material for optimum broadband solar harvesting; and horizontal toroidal response in three-dimensional plasmonic metamaterial.

Satoshi Kawata
Din Ping Tsai

