Technical Program

OpticsEast

25–28 October 2004
Exhibition: 26–27 October 2004
Pennsylvania Convention Center
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SPIE The International Society for Optical Engineering

OpticsEast

25–28 October 2004 • Pennsylvania Convention Center, Philadelphia, Pennsylvania USA

Welcome!

Optics East is a new multidisciplinary symposium in Philadelphia. Philadelphia is a world class technology and research center known for its important contributions in pharmaceuticals, telecommunications, biomedical optics and robotics.

At Optics East you will find top notch research covering the latest developments in nanotechnology, advanced networked communications, industrial and environmental sensing, pharmaceutical discovery, and more. Take advantage of this forum for the exchange of knowledge between different scientific disciplines, user communities, and continents, a hallmark of SPIE events.

In this program you will find a roster of invited plenary speakers, special events, workshops and courses that will showcase optics and photonics research under way in the Philadelphia area.

We thank you for your participation in Optics East 2004!

Tuan Vo-Dinh,
Oak Ridge National Lab.
Symposium Chair

Achyut K. Dutta,
Banpil Photonics, Inc.
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Conference 5593 • Room: 103 C

Monday-Thursday 25-28 October 2004 • Proceedings of SPIE Vol. 5593

Nanosensing: Materials and Devices

Conference Chairs: **M. Saif Islam**, Hewlett-Packard Labs. and Univ. of California/Davis; **Achyut K. Dutta**, Banpil Photonics, Inc.

Program Committee: **Yong Chen**, Univ. of California/Los Angeles; **Yoel Fink**, Massachusetts Institute of Technology; **Theodore I. Kamins**, Hewlett-Packard Labs.; **Satoshi Kawata**, Osaka Univ. (Japan); **Sehun Kim**, Korea Advanced Institute of Science and Technology (South Korea); **Sanjay Krishna**, Univ. of New Mexico; **Lih-Yuan Lin**, Univ. of Washington; **J. Jiang Liu**, Army Research Lab.; **Andrew McMillan**, NASA Ames Research Ctr.; **Martin Moskovits**, Univ. of California/Santa Barbara; **Shuming Nie**, Winship Cancer Institute/Emory Univ.; **Ekmel Özbay**, Bilkent Univ. (Turkey); **Mihrimah Ozkan**, Univ. of California/Riverside; **Nezih Pala**, Rensselaer Polytechnic Institute; **Kenko Taguchi**, Optoelectronic Industry & Technology Development Association (Japan); **Kazuyuki Tohji**, Tohoku Univ. (Japan); **Shih-Yuan Wang**, Hewlett-Packard Labs.; **Zhong Lin Wang**, Georgia Institute of Technology

Monday 25 October

SESSION 1

Room: 103 C ..... Mon. 8:30 to 10:40 am

Nanotube: Material

Chairs: **Peter J. Burke**, Univ. of California/Irvine; **Ant Ural**, Univ. of Florida

8:30 am: **Synthesis of long, aligned, carbon nanotubes for sensing applications *(Invited Paper),*** J. Hone, Columbia Univ. ..... [5593-01]

8:50 am: **Size control of carbon nanotubes for biomedical applications *(Invited Paper),*** K. Tohji, Y. Sato, Y. Akimoto, K. Shinoda, J. Balachandran, K. Motomiya, Tohoku Univ. (Japan); K. Shibata, Hokkaido Univ. (Japan) ..... [5593-02]

9:10 am: **Synthesis of inorganic thin-layer-coated carbon nanotubes towards passivated nanoprobes *(Invited Paper),*** T. Ikuno, M. Kishida, J. Lee, S. Honda, M. Katayama, H. Mori, K. Oura, Osaka Univ. (Japan) ..... [5593-03]

9:30 am: **Single-walled carbon nanotube thin films: from synthesis to devices *(Invited Paper),*** Q. Fu, S. Huang, J. Liu, Duke Univ. ..... [5593-04]

9:50 am: **Electric field assisted growth and assembly of carbon nanotubes for nano-electronics and nanosensing applications *(Invited Paper),*** A. Ural, Univ. of Florida ..... [5593-05]

Keynote

10:10 am: **Development of carbon nanotube structures for applications *(Invited Paper),*** P. M. Ajayan, Rensselaer Polytechnic Institute ..... [5593-06]

Coffee Break ..... 10:40 to 11:00 am

Nanotechnology, Nanophotonics, and Nano-Sensors Plenary I

Room: Auditorium Lecture Hall ..... Mon. 11:00 to 11:40 am

Chemical and Biological Sensing Devices, Sensor Networks, and Future Sensor Technologies, R. Stanley Williams, Hewlett-Packard Labs.

Lunch Break ..... 11:40 am to 1:00 pm

SESSION 2

Room: 103 C ..... Mon. 1:00 to 3:10 pm

Nanotube: Devices

Chairs: **Ant Ural**, Univ. of Florida; **Peter J. Burke**, Univ. of California/Irvine

Keynote

1:00 pm: **Detecting biomolecules with nanoscale active electronic devices *(Invited Paper),*** G. Gruner, Univ. of California/Los Angeles and Nanomix Inc. .... [5593-07]

1:30 pm: **Carbon nanotube chemical sensors *(Invited Paper),*** P. Kim, J. P. Small, Columbia Univ.; T. Someya, Univ. of Tokyo (Japan); C. Nuckolls, Columbia Univ. ..... [5593-08]

1:50 pm: **Carbon nanotubes-based nano-electrode arrays: fabrication, evaluation, and biosensing application *(Invited Paper),*** Y. Lin, Pacific Northwest National Lab.; Y. Tu, Boston College; F. Lu, Pacific Northwest National Lab.; Z. Ren, Boston College ..... [5593-09]

2:10 pm: **Carbon nanotube devices for GHz to THz applications *(Invited Paper),*** P. J. Burke, Univ. of California/Irvine ..... [5593-10]

2:30 pm: **Development of microwave carbon nanotube resonator sensors *(Invited Paper),*** A. H. Pham, Univ. of California/Davis ..... [5593-11]

2:50 pm: **Optical method for trapping and detection of single-walled carbon nanotubes in aqueous solution *(Invited Paper),*** Y. Zhang, Intel Corp. .... [5593-12]

Coffee Break ..... 3:10 to 3:30 pm

SESSION 3

Room: 103 C ..... Mon. 3:30 to 6:20 pm

Nano-Structures for Sensing: Exciting Developments and Future Research Directions

Chairs: **Mehdi Anwar**, Univ. of Connecticut; **Achyut K. Dutta**, Banpil Photonics, Inc.

Keynote

3:30 pm: **Nanosensors and nanoprobes for gene diagnostics and cellular bioimaging *(Invited Paper),*** T. Vo-Dinh, Oak Ridge National Lab. ..... [5593-13]

Keynote

4:00 pm: **Nanotechnology strategic plan for the U.S. Air Force *(Invited Paper),*** M. M. Freund, Air Force Research Lab. ..... [5593-14]

Keynote

4:30 pm: **Carbon nanotube-based biological and chemical sensors *(Invited Paper),*** M. Meyyappan, NASA Ames Research Ctr. ..... [5593-15]

5:00 pm: **Local synthesis of Si and SiO2 nanowires on MEMS micro-bridges for sensor applications *(Invited Paper),*** S. M. Prokes, S. Arnold, Naval Research Lab. ..... [5593-16]

5:20 pm: **Nano-bridging: a massively parallel self-assembly technique for interconnecting nanowire sensors *(Invited Paper),*** M. S. Islam, S. Sharma, T. I. Kamins, R. S. Williams, Hewlett-Packard Labs. ..... [5593-17]

5:40 pm: **Tunable surface enhanced Raman hot-spots for nanobio sensing *(Invited Paper),*** X. Zhang, K. K. Su, Q. Wei, S. Durant, Univ. of California/Los Angeles[5593-18]

6:00 pm: **Chemical sensors based on photonic crystal nanolasers *(Invited Paper),*** M. Loncar, Harvard Univ. and California Institute of Technology; M. L. Adams, Ensco, Inc. and California Institute of Technology; A. Scherer, California Institute of Technology ..... [5593-19]

Tuesday 26 October

SESSION 4

Room: 103 C ..... Tues. 8:30 to 10:10 am

Synthesis and Assembly Mechanisms of Nanostructure Arrays for Sensing

Chairs: **Chongwu Zhou**, Univ. of Southern California; **Zhiyong Li**, Hewlett-Packard Labs.

8:30 am: **Carbon nanopipettes and micropipes for electrochemical sensing and microfluidics *(Invited Paper),*** R. C. Mani, G. Bhimarasetti, M. K. Sunkara, Univ. of Louisville ..... [5593-20]

8:50 am: **Large-scale and highly ordered 1D nanostructural arrays by template-assisted electrodeposition *(Invited Paper),*** D. Xu, Peking Univ. (China) .. [5593-21]

9:10 am: **Complex-oriented nanostructures for chemical- and biosensing *(Invited Paper),*** J. Liu, Sandia National Labs. ..... [5593-22]

9:30 am: **Integration of metal-oxide nanobelts with microsystems for sensor applications *(Invited Paper),*** C. Yu, S. Saha, C. Villalobos, L. Shi, Univ. of Texas/Austin; X. Kong, Z. L. Wang, Georgia Institute of Technology ..... [5593-23]

9:50 am: **Pulse electron-beam deposition of novel materials *(Invited Paper),*** J. F. Muth, North Carolina State Univ. ..... [5593-24]

Coffee Break ..... 10:10 to 10:30 am

SESSION 5

Room: 103 C ..... Tues. 10:30 am to 12:00 pm

Chemical Assembly of Nanostructured Films for Sensing Applications

Chairs: **Chongwu Zhou**, Univ. of Southern California; **Zhiyong Li**, Hewlett-Packard Labs.

Keynote

10:30 am: **Chemical assembly of nanostructured films for sensing applications *(Invited Paper)*,** S. Yang, Hong Kong Univ. of Science and Technology (Hong Kong China) ..... [5593-25]

11:00 am: **Platinum and gold passivated nanowire arrays on Si(001) *(Invited Paper)*,** R. Ragan, S. Kim, D. A. A. Ohlberg, Hewlett-Packard Labs.; Y. Chen, Univ. of California/Los Angeles; R. S. Williams, Hewlett-Packard Labs. ..... [5593-26]

11:20 am: **Chemical design of inorganic nanowires, nanotubes, and nanowire networks *(Invited Paper)*,** M. K. Sunkara, Univ. of Louisville ..... [5593-27]

11:40 am: **Template-based growth of nanorod arrays by solution methods *(Invited Paper)*,** G. Z. Cao, Univ. of Washington ..... [5593-28]

Lunch Break ..... 12:00 to 1:30 pm

Nanotechnology, Nanophotonics, and Nano-Sensors Plenary II

Room: Auditorium Lecture Hall ..... Tues. 1:30 to 2:10 pm

Engineering Nanotechnology for Advanced Electronic Applications, Daniel J. Radack, DARPA

SESSION 6

Room: 103 C ..... Tues. 2:15 to 2:55 pm

Novel Engineered Nanostructures for Sensor Applications

Chairs: **Regina Ragan**, Univ. of California/Irvine; **M. Saif Islam**, Univ. of California/Davis

Keynote

2:15 pm: **Semiconducting and piezoelectric nanobelts, nanosprings, and nanorings for sensing *(Invited Paper)*,** Z. L. Wang, Georgia Institute of Technology .. [5593-29]

2:35 pm: **Electrochemically grown single nanowire sensors *(Invited Paper)*,** M. Yun, C. Lee, R. P. Vasquez, Jet Propulsion Lab.; N. V. Myung, A. Mulchandani, K. Ramanathan, M. Bangar, W. Chen, Univ. of California/Riverside ..... [5593-30]

Coffee Break ..... 2:55 to 3:20 pm

SESSION 7

Room: 103 C ..... Tues. 3:20 to 4:40 pm

Integrated Chemical/Biological Nano-Sensor Devices

Chairs: **Regina Ragan**, Univ. of California/Irvine; **M. Saif Islam**, Univ. of California/Davis

3:20 pm: **Nanowires and nanotubes for chemical and biosensing applications *(Invited Paper)*,** C. Zhou, Univ. of Southern California ..... [5593-31]

3:40 pm: **Sequence-specific DNA sensors based on silicon nanowires *(Invited Paper)*,** Z. Li, Hewlett-Packard Labs.; Y. Chen, Univ. of California/Los Angeles; X. Li, T. I. Kamins, R. S. Williams, Hewlett-Packard Labs. ..... [5593-32]

4:00 pm: **Nanofabricated metal and semiconductor building blocks for devices and sensors *(Invited Paper)*,** J. A. Rogers, Univ. of Illinois/Urbana-Champaign [5593-33]

4:20 pm: **Nanostructure engineered chemical sensors for hazardous gas and vapor detection *(Invited Paper)*,** J. Li, NASA Ames Research Ctr. ..... [5593-34]

Room: 103 C ..... Tues. 4:40 pm

Late Breaking News

Chairs: **M. Saif Islam**, Univ. of California/Davis; **Achyut K. Dutta**, Banpil Photonics, Inc.

✔ Posters-Tuesday

Posters will be on display starting 10:00 am Tuesday morning in Exhibition Hall C. A poster reception, with authors present at their posters, will be held Tuesday evening from 5:30 to 7:00 pm. Light refreshments will be served. Poster authors, see p. 83 for setup instructions.

✔ **Electrochemical sensors based on functionalized nanoporous silica for environmental monitoring,** Y. Lin, W. Yantasee, X. Li, G. E. Fryxell, Pacific Northwest National Lab. ..... [5593-91]

✔ **Mosaic DNA chip fabrication and its time-resolved fluorescence detection,** Q. He, H. Chen, Zhuzhou Institute of Technology (China); P. Xiao, Southeast Univ. (China); N. He, Zhuzhou Institute of Technology (China) ..... [5593-92]

✔ **DNA: micro-arrays on a mesospaced surface,** B. J. Hong, J. W. Park, Pohang Univ. of Science and Technology (South Korea) ..... [5593-94]

✔ **Low-energy electron beam irradiation promoted selective cleavage of surface furoxan,** C. O. Kim, J. W. Park, Pohang Univ. of Science and Technology (South Korea) ..... [5593-96]

✔ **Parametric study of whispering-gallery-mode,** H. Quan, Z. Guo, Rutgers Univ.; S. Pau, Lucent Technologies/Bell Labs. ..... [5593-97]

✔ **Tuning internal diameter and conical angle of carbon nano/micro-tubular structures,** G. Bhimarasetti, M. K. Sunkara, Univ. of Louisville ..... [5593-98]

✔ **C60 thin films for optical fiber coating applications,** A. H. Jayatissa, Univ. of Toledo ..... [5593-99]

✔ **Optical characteristics of electrochemically fabricated porous silicon microcavities,** A. A. Kanan, S. P. Jambulingam, P. K. Ghosh, Syracuse Univ. ..... [5593-100]

✔ **Improvement of hybridization signals of colorimetric gene detection,** N. He, Southeast Univ. (China) ..... [5593-101]

✔ **Biocompatibility of carbon nanotubes disk,** M. Ohtsubo, Y. Sato, K. Shinoda, J. Balachandran, K. Tohji, K. Motomiya, G. Yamamoto, M. Ohmori, T. Hashida, Tohoku Univ. (Japan); A. Yokoyama, Hokkaido Univ. (Japan) ..... [5593-102]

✔ **Size-controlled synthesis of metal oxide particles for biomedical application,** T. Atsumi, Tohoku Univ. (Japan); K. Tamura, Hokkaido Univ. (Japan); J. Balachandran, K. Tohji, Tohoku Univ. (Japan) ..... [5593-103]

✔ **Potential of magnetic metal nanoparticles for biomedical applications,** J. Balachandran, C. N. Chinnasamy, T. Atsumi, Y. Sato, K. Tohji, Tohoku Univ. |(Japan) ..... [5593-104]

✔ **Fabrication of chalcogenide glass waveguide for IR evanescent wave sensors,** A. Ganjoo, H. Jain, Lehigh Univ.; J. V. Ryan, R. Chanda, The Pennsylvania State Univ.; R. Song, Lehigh Univ.; J. Irudayaraj, The Pennsylvania State Univ.; Y. J. Ding, Lehigh Univ.; C. G. Pantano, The Pennsylvania State Univ. ..... [5593-105]

✔ **Characterization of sculptured thin films,** J. V. Ryan, M. W. Horn, A. Lakhtakia, C. G. Pantano, The Pennsylvania State Univ. ..... [5593-106]

Wednesday 27 October

Sessions 8 and 11 run concurrently.

SESSION 8

Room: 103 C . . . . . Wed. 8:30 to 10:40 am

Functionalization and Patterning of Surfaces with Biomolecules

Chairs: **Andrew McMillan**, NASA Ames Research Ctr.; **Sehun Kim**, Korea Advanced Institute of Science and Technology (South Korea)

8:30 am: **Mesospaced surface for DNA: micro-array and other applications *(Invited Paper)*,** J. W. Park, Pohang Univ. of Science and Technology (South Korea) [5593-35]

8:50 am: **Patterning silicon surfaces with covalently attached DNA at sub-micrometer resolution *(Invited Paper)*,** X. Zhao, J. Ouyang, Peking Univ. (China) . . . . . [5593-36]

9:10 am: **Micropatterning proteins on substrates to direct cell growth for neural prostheses *(Invited Paper)*,** S. F. Bent, N. Mehenti, H. Fishman, Stanford Univ. . . . . [5593-37]

9:30 am: **Molecular biomimetics: genetically engineered polypeptides for inorganics and GEPI as molecular building blocks *(Invited Paper)*,** M. Sarikaya, Univ. of Washington; C. Tamerler, Istanbul Technical Univ. (Turkey); A. Jen, D. T. Schwartz, B. Traxler, F. Baneyx, Univ. of Washington . . . . . [5593-38]

9:50 am: **Nanoscopic synthetic templates based on self-assembled helical fibrils *(Invited Paper)*,** V. P. Conticello, Y. Zimenkov, Emory Univ. . . . . [5593-39]

Keynote

10:10 am: **Supramolecular interfacial architectures for biosensing *(Invited Paper)*,** W. Knoll, Max-Planck-Institut für Polymerforschung (Germany) . . . . . [5593-40]

Coffee Break . . . . . 10:40 to 11:00 am

SESSION 11

Room: 102 A . . . . . Wed. 8:10 to 10:40 am

Advanced Nanofabrication, Novel Techniques and Devices for Sensing

Chairs: **William M. Tong**, Hewlett-Parkard Labs.; **Pavel Kornilovich**, Hewlett-Packard Co.

8:10 am: **Ultrahigh-Q toroid microcavities on a chip *(Invited Paper)*,** T. J. Kippenberg, S. M. Spillane, D. K. Armani, K. J. Vahala, California Institute of Technology [5593-55]

8:30 am: **Novel lead-salt mid-infrared lasers for gas sensing *(Invited Paper)*,** Z. Shi, X. Lu, F. Zhao, A. Majumdar, D. Ray, R. Singh, X. Yan, Univ. of Oklahoma . [5593-56]

8:50 am: **Applications of integrated optical devices for nanoscale displacement sensing *(Invited Paper)*,** I. Kiyat, Bilkent Univ. (Turkey); C. Kocabas, Univ. of Illinois/Urbana-Champaign; A. Kocabas, A. Aydinli, Bilkent Univ. (Turkey) . . . . . [5593-57]

9:10 am: **Nanoscale characterization and fabrication with the atomic force microscope and carbon nanotube probes *(Invited Paper)*,** R. M. Stevens, NASA Ames Research Ctr.; Y. Li, Palo Alto High School; M. Meyyappan, C. V. Nguyen, NASA Ames Research Ctr. . . . . [5593-58]

9:30 am: **Integrated poly-sige nanomechanical resonators for wireless sensor nodes *(Invited Paper)*,** E. P. Quevy, T. King, R. T. Howe, Univ. of California/Berkeley[5593-59]

9:50 am: **Sub-diffraction-limit nano-photonic waveguides by quantum-dot array structure: modeling and simulation *(Invited Paper)*,** C. Wang, L. Lin, Univ. of Washington . . . . . [5593-60]

Keynote

10:10 am: **Microdevices for biomolecular detection *(Invited Paper, Presentation Only)*,** S. R. Manalis, T. Burg, N. Milovic, P. Russo, T. L. Loh, C. Tsau, G. Popescu, Massachusetts Institute of Technology . . . . . [5593-61]

Nanotechnology, Nanophotonics, and Nano-Sensors Plenary III

Room: Auditorium Lecture Hall . . . . . Wed. 11:00 to 11:40 am

What is the "Bio" in Bio-Nanotechnology?, Jonathan D. Trent, Andrew McMillan, Chad Paavola, NASA Ames Research Ctr.

Lunch/Exhibition Break . . . . . 11:40 am to 1:00 pm

Sessions 9 and 12 run concurrently.

SESSION 9

Room: 103 C . . . . . Wed. 1:00 to 2:55 pm

Bio-Inspired Assembly of Biomaterials, Hybrid Systems, and Nanoprobes for Biosensing

Chairs: **Sehun Kim**, Korea Advanced Institute of Science and Technology (South Korea); **Andrew McMillan**, NASA Ames Research Ctr.

1:00 pm: **Nano-assembly of immobilized ligninolytic enzymes for biocatalysis, bioremediation, and biosensing *(Invited Paper)*,** D. Kuila, Louisiana Tech Univ.; M. Tien, The Pennsylvania State Univ.; Y. M. Lvov, M. J. McShane, R. K. Aithal, S. Singh, A. Potluri, N. Bolden, S. Kaul, Louisiana Tech Univ. . . . . [5593-41]

1:20 pm: **Protein engineering for controlled patterning and self-assembly of nanoscale materials *(Invited Paper)*,** A. McMillan, J. D. Trent, C. Paavola, NASA Ames Research Ctr.; J. Howard, H. Kagawa, Y. Li, S. Chan, SETI Institute/NASA Ames Research Ctr. . . . . [5593-42]

1:40 pm: **Using self-assembly for the construction of nanoscale lateral-transport molecular electronic devices and microscale silicon-based networks *(Invited Paper)*,** B. A. Parviz, J. Dong, H. Ma, A. Jen, Univ. of Washington . . . . . [5593-43]

2:00 pm: **Nanocarbon materials for active electronics and bionanotechnology *(Invited Paper)*,** C. S. Ozkan, Univ. of California/Riverside . . . . . [5593-44]

2:20 pm: **Interaction analysis and nanoscale fabrication of biomolecular array by force spectroscopy using AFM probe *(Invited Paper)*,** C. Nakamura, Tokyo Univ. of Agriculture and Engineering (Japan); N. Nakamura, Shinkosha Co., Ltd. (Japan); J. Miyake, Tokyo Univ. of Agriculture and Engineering (Japan) . . . . . [5593-45]

2:40 pm: **In-situ synthesis of oligonucleotides on plasma-modified PTFE for fabricating DNA chips,** N. He, Southeast Univ. (China) . . . . . [5593-46]

SESSION 12

Room: 102 A . . . . . Wed. 1:00 to 3:00 pm

Photonic Crystals and Quantum Structures for Sensing

Chairs: **Marko Loncar**, Harvard Univ.; **Shu Peng**, Stanford Univ.

1:00 pm: **Two-dimensional photonic crystal structures for biosensing applications *(Invited Paper)*,** A. C. Grot, E. Chow, L. W. Mirkarimi, M. Sigalas, D. Sobek, Agilent Technologies Inc. . . . . [5593-62]

1:20 pm: **Surface-emitting photonic crystal microcavity quantum cascade lasers and their applications *(Invited Paper)*,** M. Troccoli, F. Capasso, Harvard Univ.; R. Colombelli, Univ. Paris-Sud (France); K. Srinivasan, O. Painter, California Institute of Technology; C. Gmachl, Princeton Univ. . . . . [5593-63]

1:40 pm: **Microstructured fibers for light sensing *(Invited Paper)*,** M. Bayindir, F. Sorin, A. F. Abouraddy, J. F. Viens, Y. Fink, Massachusetts Institute of Technology . . . . . [5593-64]

2:00 pm: **Graded-index colloidal photonic crystals and their versatile photonic applications *(Invited Paper)*,** D. Kim, J. Park, Kwangju Institute of Science and Technology (South Korea) . . . . . [5593-65]

2:20 pm: **Quantum dot detectors for mid-infrared sensing: bias controlled spectral tuning and matched filtering *(Invited Paper)*,** U. Sakoglu, Z. Wang, P. Dowd, S. Annamalai, M. M. Hayat, J. S. Tyo, S. Krishna, Univ. of New Mexico . . . . . [5593-66]

2:40 pm: **Single-atom-doped nanoparticles as quantum detectors *(Invited Paper)*,** A. Konjhodzic, Z. Hasan, Temple Univ. . . . . [5593-67]

Coffee Break . . . . . 3:00 to 3:30 pm

Sessions 10 and 13 run concurrently.

SESSION 10

Room: 103 C . . . . . Wed. 3:30 to 6:20 pm

Hybrid Systems and Nanoprobes for Biosensing

Chairs: **Cengiz S. Ozkan**, Univ. of California/Riverside; **Mehmet Sarikaya**, Univ. of Washington

Keynote

3:30 pm: **Luminescent quantum dots and optically encoded beads for multiplexed biological detection and imaging *(Invited Paper)*,** X. Gao, Emory Univ. and Georgia Institute of Technology . . . . . [5593-47]

4:00 pm: **Hybrid nanoprobes for detection of nucleic acids *(Invited Paper)*,** M. Ozkan, Univ. of California/Riverside . . . . . [5593-48]

4:20 pm: **Inorganic nanoprobes for biology *(Invited Paper)*,** A. Boccara, B. Dubertret, Ecole Supérieure de Physique et de Chimie Industrielles (France) . . . . . [5593-49]

4:40 pm: **Design of multifunctional QD-bioconjugates and their use in fluorescence resonance energy transfer assays *(Invited Paper)*,** H. Mattoussi, H. T. Uyeda, I. L. Medintz, A. R. Clapp, Naval Research Lab. . . . . [5593-50]

5:00 pm: **Nanoshells for integrated diagnosis and therapy of cancer *(Invited Paper)*,** R. A. Drezek, Rice Univ. . . . . [5593-51]

5:20 pm: **Nanocomposite particles containing magnetic and luminescent nanocrystals and their biological applications *(Invited Paper)*,** Z. Rosenzweig, L. Rossi, Univ. of New Orleans . . . . . [5593-52]

5:40 pm: **Nanoscale fluoro-immuno-assays with lanthanide oxide nanoparticles *(Invited Paper)*,** I. M. Kennedy, M. M. Koivunen, S. M. Gee, C. M. Cummins, R. M. Perron, D. M. Dosev, B. M. Hammock, Univ. of California/Davis . . . . . [5593-53]

6:00 pm: **BioMEMS to bionanotechnology: state-of-the-art in integrated biochips and future prospects *(Invited Paper)*,** R. Bashir, Purdue Univ. . . . . [5593-54]

SESSION 13

Room: 102 A . . . . . Wed. 3:30 to 6:00 pm

Theoretical Modeling of Nanomaterials and Its Applications

Chairs: **Marko Loncar**, Harvard Univ.; **Shu Peng**, Stanford Univ.

Keynote

3:30 pm: **Nanosensor design for molecular recognition *(Invited Paper)*,** K. Cho, Stanford Univ. . . . . [5593-68]

4:00 pm: **Localization and shot noise in nanostructures *(Invited Paper)*,** M. Anwar, Univ. of Connecticut . . . . . [5593-69]

4:20 pm: **Sensing mechanical deformation in carbon nanotubes by electrical response: a computational study *(Invited Paper)*,** A. M. Anantram, A. Svizhenko, H. Mehrez, NASA Ames Research Ctr. . . . . [5593-70]

4:40 pm: **Modeling field-effect pH sensor *(Invited Paper)*,** P. Kornilovich, Hewlett-Packard Co. . . . . [5593-71]

5:00 pm: **Sensors based on nanotubes and nanowires: molecular modeling applications *(Invited Paper)*,** A. Maiti, Accelrys, Inc. . . . . [5593-72]

5:20 pm: **Computational design of nanostructures and nanostructured materials *(Invited Paper)*,** G. A. Galli, A. Williamson, J. Grossman, R. Hood, A. Puzder, Lawrence Livermore National Lab.; J. Raty, Univ. de Liège (Belgium); A. van Buuren, L. Terminello, F. Gygi, F. Reboredo, Lawrence Livermore National Lab.; L. Pizzagalli, Univ. de Poitiers (France); E. Draeger, E. Schwegler, Lawrence Livermore National Lab. . . . . [5593-73]

5:40 pm: **Calculating transport properties of nanodevices *(Invited Paper)*,** E. F. Darve, Y. Teslyar, Stanford Univ. . . . . [5593-74]

Thursday 28 October

SESSION 14

Room: 103 C . . . . . Thurs. 8:10 to 10:30 am

Surface-Enhanced Metal Nanoparticle Probes and Quantum-Dot Probes for Molecular Imaging and Profiling I

Chairs: **Andrew McMillan**, NASA Ames Research Ctr.; **Mihrimah Ozkan**, Univ. of California/Riverside

8:10 am: **Multiplexed Raman spectroscopic detection of protein biomarkers in cells and tissues with silver-enhanced gold nanoparticle probes *(Invited Paper)*,** D. O. Ansari, S. Nie, Georgia Institute of Technology and Emory Univ. School of Medicine . . . . . [5593-75]

8:30 am: **Read-out strategies using nanometric labels *(Invited Paper)*,** M. D. Porter, Iowa State Univ. . . . . [5593-76]

8:50 am: **Biological applications of nanolabels based on surface enhanced Raman scattering *(Invited Paper)*,** M. J. Natan, Nanoplex Technologies, Inc. . . . . [5593-109]

9:10 am: **Surface-enhanced Raman scattering from engineered nanowire-nanoparticle structures *(Invited Paper)*,** T. Livneh, Univ. of California/Santa Barbara and NRCN (Israel); I. Pavel, M. Moskovits, Univ. of California/Santa Barbara[5593-77]

9:30 am: **Adaptive SERS substrates for protein sensing *(Invited Paper)*,** V. M. Shalaev, V. P. Drachev, D. Ben-Amotz, V. J. Davisson, M. Thoreson, V. Nashine, E. Khaliullin, Purdue Univ. . . . . [5593-78]

9:50 am: **Optical fiber biosensor based on localized surface plasmon resonance in gold nanoparticles *(Invited Paper)*,** K. Kajikawa, Tokyo Institute of Technology (Japan); K. Mitsui, Japan Science and Technology Agency (Japan) . . . . . [5593-79]

10:10 am: **Nanotip arrays fabricated by one-step and self-masked ECR-plasma etching and their applications for field emission, anti-reflection, and sensing *(Invited Paper)*,** L. Chen, J. Hsu, National Taiwan Univ. (Taiwan); H. Lo, Academia Sinica (Taiwan) and National Chiao-Tung Univ. (Taiwan); I. Huang, National Taipei Univ. of Technology (Taiwan); K. Chen, Academia Sinica (Taiwan) and National Taiwan Univ. (Taiwan); C. Lin, National Taipei Univ. of Technology (Taiwan); C. Chen, National Chiao-Tung Univ. (Taiwan) . . . . . [5593-80]

Coffee Break . . . . . 10:30 to 11:00 am

Nanotechnology, Nanophotonics, and Nano-Sensors Plenary IV

Room: Auditorium Lecture Hall . . . . . Thurs. 11:00 to 11:40 am

Nanotechnology: Applications and Trends, Christie R. K. Marrian, IBM Almaden Research Ctr.

Lunch Break . . . . . 11:40 am to 1:00 pm

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SESSION 15

Room: 103 C . . . . . Thurs. 1:00 to 2:00 pm

Surface-Enhanced Metal Nanoparticle Probes and Quantum Dot Probes for Molecular Imaging and Profiling II

Chairs: **Mihrimah Ozkan**, Univ. of California/Riverside; **Andrew McMillan**, NASA Ames Research Ctr.

1:00 pm: **Semiconductor quantum dots as targeted contrast agents for in vivo molecular imaging *(Invited Paper),*** A. M. Smith, Georgia Institute of Technology; S. Nie, Georgia Institute of Technology and Emory Univ. . . . . [5593-81]

1:20 pm: **Plasmonics: metallic nanostructures for energy guiding and sensing *(Invited Paper),*** S. A. Maier, California Institute of Technology . . . . . [5593-82]

1:40 pm: **Immobilization of photo-crosslinked polymers on an optical fiber tip for biochemical sensing *(Invited Paper),*** Y. Chen, S. Prahl, Oregon Health and Science Univ.; M. Yan, Portland State Univ. . . . . [5593-108]

SESSION 16

Room: 103 C . . . . . Thurs. 2:00 to 4:50 pm

THz for Imaging and Sensing

Chairs: **James Kolodzey**, Univ. of Delaware; **Nezih Pala**, Rensselaer Polytechnic Institute

Keynote

2:00 pm: **Terahertz plasma-wave electronics *(Invited Paper),*** M. S. Shur, Rensselaer Polytechnic Institute; W. Knap, Univ. Montpellier II (France); V. Ryzhii, Univ. of Aizu (Japan) . . . . . [5593-83]

2:30 pm: **Room-temperature semiconductor modulators for free-space signal transmission with THz waves *(Invited Paper),*** T. Kleine-Ostmann, Technische Univ. Braunschweig (Germany); K. Pierz, G. Hein, Physikalisch-Technische Bundesanstalt (Germany); P. Dawson, Univ. of Manchester (United Kingdom); M. Koch, Technische Univ. Braunschweig (Germany) . . . . . [5593-84]

2:50 pm: **Terahertz near-field microscopy *(Invited Paper),*** H. Chen, Rensselaer Polytechnic Institute; G. C. Cho, IMRA America; R. Kersting, Univ. München (Germany) . . . . . [5593-85]

3:10 pm: **New approaches in semiconductor-based terahertz technology *(Invited Paper),*** D. S. Citrin, Georgia Institute of Technology . . . . . [5593-86]

Coffee Break . . . . . 3:30 to 3:50 pm

3:50 pm: **Electro-optic polymers for THz applications *(Invited Paper),*** A. M. Sinyukov, M. R. Leahy, M. Hayden, Univ. of Maryland/Baltimore County . . . . . [5593-87]

4:10 pm: **Terahertz-emitting devices based on impurity transitions in doped silicon *(Invited Paper),*** J. Kolodzey, P. Lv, R. T. Troeger, S. Kim, Univ. of Delaware . [5593-88]

4:30 pm: **Terahertz emission spectroscopy *(Invited Paper),*** J. A. Deibel, D. Mittleman, Rice Univ. . . . . [5593-89]

Courses of related interest.

SC497 Nanophotonics (Prasad) Mon. 1:30 to 5:30 pm

SC309 Fluorescent Markers: Usage and Optical System Optimization (Levi) Mon. 8:30 am to 12:30 pm

SC461 Bio-Optical Detection Systems (Levi) Mon. 1:30 to 5:30 pm

SC595 Overview of Biotechnology Advances (Niemeyer) Mon. 8:30 am to 12:30 pm

SC675 Lab-on-a-Chip Devices (Theory, Fabrication, Application) (Geschke/Telleman) Mon. 8:30 am to 5:30 pm

SC671 Carbon Nanotubes: Properties, Growth, and Applications (Ural) Tues. 1:30 to 5:30 pm

SC672 Measuring Nanotopography with Scanned Probe Microscopes (Griffith) Wed. 8:30 am to 12:30 pm

SC496 Fabrication and Processing of Nanostructures (Cao) Thurs. 8:30 am to 5:30 pm

SC279 Introduction to Sensor Systems (Becherer) Thurs. 8:30 am to 5:30 pm