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Front Matter: Volume 6959

, "Front Matter: Volume 6959," Proc. SPIE 6959, Micro (MEMS) and Nanotechnologies for Space, Defense, and Security II, 695901 (2 May 2008); doi: 10.1117/12.798094

SPIE.

Event: SPIE Defense and Security Symposium, 2008, Orlando, Florida, United States

PROCEEDINGS OF SPIE

Micro (MEMS) and Nanotechnologies for Space, Defense, and Security II

**Thomas George
Zhongyang Cheng**
Editors

**18–20 March 2008
Orlando, Florida, USA**

Sponsored and Published by
SPIE

Volume 6959

Proceedings of SPIE, 0277-786X, v. 6959

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Author(s), "Title of Paper," in *Micro (MEMS) and Nanotechnologies for Space, Defense, and Security II*, edited by Thomas George, Zhongyang Cheng, Proceedings of SPIE Vol. 6959 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X

ISBN 9780819471505

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

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Printed in the United States of America.

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Contents

- vii *Conference Committee*
- ix *Introduction*
- xi *Deep space flight of Hayabusa asteroid explorer (Plenary Paper) [6960-100]*
H. Kuninaka, J. Kawaguchi, Japan Aerospace Exploration Agency (Japan)
- xxi *Nano-enabled defense opportunities (Keynote Presentation, Abstract Only) [6959-1]*
D. L. Polla, Defense Advanced Research Projects Agency (USA)
- xxiii *Emerging sensors and electron devices for Army applications (Keynote Presentation) [6959-9]*
J. Pellegrino, Army Research Lab. (USA)

NANOWIRES AND NANOTUBES

- 6959 03 **Wide bandgap nanowire sensors (Invited Paper) [6959-02]**
S. J. Pearton, B. S. Kang, B. P. Gila, D. P. Norton, L. C. Tien, H. T. Wang, F. Ren, J. Lin, Univ. of Florida (USA)
- 6959 04 **Cadmium zinc telluride (CZT) nanowire sensors for detection of low-energy gamma-ray detection [6959-03]**
T. Gandhi, K. S. Raja, M. Misra, Univ. of Nevada, Reno (USA)
- 6959 05 **Controlled growth of ZnO nanorod arrays and their PL properties [6959-04]**
M. Wang, Z. Xu, Z. Wang, Y. Xue, J. Zhu, Xi'an Jiaotong Univ. (China)
- 6959 06 **Application specific electrode-integrated nanotube cathodes (ASINCS) for miniature analytical instruments for space exploration (Invited Paper) [6959-05]**
H. M. Manohara, M. J. Bronikowski, R. Toda, E. Urgiles, R. H. Lin, K. Y. Yee, A. B. Kaul, J. Hong, Jet Propulsion Lab. (USA)
- 6959 07 **Effect of nitrogen gas on the lifetime of carbon nanotube field emitters for electron-impact ionization mass spectrometry [6959-06]**
S. A. Getty, R. A. Bis, NASA Goddard Space Flight Ctr. (USA); S. Snyder, Lehigh Univ. (USA); E. Gehrels, K. Ramirez, T. T. King, P. A. Roman, P. R. Mahaffy, NASA Goddard Space Flight Ctr. (USA)
- 6959 09 **Carbon nanotube switches for communication and memory applications [6959-08]**
A. B. Kaul, L. Epp, Jet Propulsion Lab. (USA); E. W. Wong, Atomate Corp. (USA); R. Kowalczyk, Jet Propulsion Lab. (USA)

COMPLEX MEMS

- 6959 OC **Development and operation of the microshutter array system (Invited Paper)** [6959-10]
M. D. Jhabvala, D. Franz, T. King, NASA Goddard Space Flight Ctr. (USA); G. Kletetschka, Catholic Univ. of America (USA); A. S. Kuttyrev, Univ. of Maryland, College Park (USA); M. J. Li, S. E. Meyer, S. H. Moseley, S. Schwinger, R. Silverberg, NASA Goddard Space Flight Ctr. (USA)
- 6959 OD **Texas Instruments' DLP products massively paralleled MOEMS arrays for display applications: a distant second to Mother Nature (Invited Paper)** [6959-12]
P. I. Oden, Texas Instruments Inc. (USA)
- 6959 OE **Simulation of a miniature, low-power time-of-flight mass spectrometer for in situ analysis of planetary atmospheres (Invited Paper)** [6959-13]
T. T. King, S. A. Getty, P. A. Roman, F. A. Herrero, H. H. Jones, D. M. Kahle, B. Lynch, G. Suárez, W. B. Brinckerhoff, P. R. Mahaffy, NASA Goddard Space Flight Ctr. (USA)
- 6959 OF **Carbon nanotube vacuum gauges utilizing long, dissipative tubes** [6959-14]
A. B. Kaul, H. M. Manohara, Jet Propulsion Lab. (USA)
- 6959 OG **A miniature MEMS and NEMS enabled time-of-flight mass spectrometer for investigations in planetary science** [6959-15]
P. A. Roman, W. B. Brinckerhoff, S. A. Getty, F. A. Herrero, R. Hu, H. H. Jones, D. Kahle, T. T. King, P. Mahaffy, NASA Goddard Space Flight Ctr. (USA)

DIP PEN NANOLITHOGRAPHY

- 6959 OI **Commercially available high-throughput Dip Pen Nanolithography** [6959-17]
J. R. Haaheim, E. R. Tevaarwerk, J. Fragala, R. Shile, NanoInk, Inc. (USA)
- 6959 OJ **Application of solid phase direct write (SPDW) via scanning force microscopy for electrical devices and sensors** [6959-18]
P. S. Spinney, S. D. Collins, R. L. Smith, Univ. of Maine (USA)
- 6959 OK **Room temperature synthesis of carbon nanotubes using Dip Pen Nanolithography (DPN)** [6959-19]
R. V. Gargate, D. Banerjee, Texas A&M Univ. (USA)

ADVANCED MEMS DEVICES AND FABRICATION

- 6959 ON **Micromechanical sensors based on conformational change of proteins** [6959-22]
X. Yang, K. R. Buchapudi, H. Gao, X. Xu, H.-F. Ji, Louisiana Tech Univ. (USA)
- 6959 OP **FPGA platform for MEMS Disc Resonance Gyroscope (DRG) control** [6959-24]
D. Keymeulen, C. Peay, D. Foor, Jet Propulsion Lab. (USA); T. Trung, Univ. of California, Berkeley (USA); A. Bakhshi, B&A Engineering Inc. (USA); P. Withington, K. Yee, R. Terrile, Jet Propulsion Lab. (USA)
- 6959 OQ **Fabrication and control of an electrostatically levitated rotating gyro** [6959-25]
C. D. Ellis, B. M. Wilamowski, Auburn Univ. (USA)

NANO-BIO-INFO TECHNOLOGIES

- 6959 OS **Experimental results of chemical recording using thermally sensitive liposomes** [6959-27]
M. E. Tanner, Duke Univ. (USA); E. A. Vasievich, Univ. of North Carolina (USA); J. M. Protz, Duke Univ. (USA)

BIOSENSORS

- 6959 OW **Detection of nucleic acid hybridization via oxide-gated carbon nanotube field-effect transistors (Invited Paper)** [6959-31]
K. H. Aschenbach, H. Pandana, J. Lee, Univ. of Maryland, College Park (USA); J. Khan, National Institutes of Health (USA); M. Fuhrer, D. Lenski, R. D. Gomez, Univ. of Maryland, College Park (USA)
- 6959 OX **Photochemical three-dimensional fabrication with nanopore membranes for biological applications** [6959-32]
C.-M. Cheng, P. R. LeDuc, Carnegie Mellon Univ. (USA)
- 6959 OY **Development and characterization of a microheater array device for real-time DNA mutation detection** [6959-33]
L. Williams, Univ. of Utah (USA); M. Okandan, Sandia National Labs. (USA); A. Chagovetz, S. Blair, Univ. of Utah (USA)

PHOTONIC SENSORS

- 6959 10 **Photonic crystals utilized for label-free and amplified fluorescence biodetection (Invited Paper)** [6959-35]
B. T. Cunningham, Univ. of Illinois at Urbana-Champaign (USA)
- 6959 11 **Fine tune localized surface plasmon resonance for chemical and biological sensors** [6959-36]
J.-X. Fu, Y.-P. Zhao, Univ. of Georgia (USA)
- 6959 12 **Passivation of aluminum for micromachining silicon sensors** [6959-37]
A. Duan, Vestfold Univ. College (Norway); X. Chen, Vestfold Univ. College (Norway) and Xiamen Univ. (China)
- 6959 13 **Plasmonic sensors based on nano-holes: technology and integration (Invited Paper)** [6959-38]
R. Gordon, D. Sinton, A. G. Brolo, Univ. of Victoria (Canada); K. L. Kavanagh, Simon Fraser Univ. (Canada)

ADAPTIVE OPTICS

- 6959 14 **MEMS deformable mirrors for space and defense applications (Invited Paper)** [6959-39]
T. G. Bifano, Boston Univ. (USA) and Boston Micromachines Corp. (USA); P. Bieren, S. A. Cornelissen, Boston Micromachines Corp. (USA)

- 6959 15 **Wiregrid micro-polarizers for mid-infrared applications** [6959-40]
 A. M. Sarangan, A. Mahfoud, Z. Wu, Q. Zhan, Univ. of Dayton (USA); D. P. Forrai,
 D. W. Endres, J. W. Devitt, L-3 Communications Cincinnati Electronics, Inc. (USA); R. T. Mack,
 J. S. Harris, Air Force Research Lab. (USA)

POSTER SESSION

- 6959 17 **Domain wall resistance in AlFe nanocontact** [6959-42]
 P. Xu, H. San, Xiamen Univ. (China); X. Chen, Xiamen Univ. (China) and Vestfold Univ.
 College (Norway)
- 6959 18 **Internationalization of gold and nickel nanowires by living cells** [6959-43]
 H. Yu, Y.-T. Tsai, H. Wang, E. H. Yang, Stevens Institute of Technology (USA)
- 6959 1A **ZnO nanostructures for optoelectronic applications** [6959-45]
 A. K. Sood, Y. R. Puri, Magnolia Optical Technologies, Inc. (USA); W. Mai, P. Gao, C. Lao,
 Z. L. Wang, Georgia Institute of Technology (USA); D. L. Polla, DARPA/MTO (USA);
 M. B. Soprano, DARPA Programs Office, U.S. Army (USA)
- 6959 1B **Modeling nanoscale ink transport in Dip Pen Nanolithography** [6959-47]
 O. A. Nafday, Nanolnk, Inc. (USA); M. W. Vaughn, Texas Tech Univ. (USA); J. Haaheim,
 Nanolnk, Inc. (USA); B. L. Weeks, Texas Tech Univ. (USA)

Author Index

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Eui-Hyeok Yang, Stevens Institute of Technology (USA)

Session Chairs

- 1 Keynote Session I
 Ashok K. Sood, Magnolia Optical Technologies, Inc. (USA)
- 2 Nanowires and Nanotubes
 Harish M. Manohara, Jet Propulsion Laboratory (USA)
 Stephanie A. Getty, NASA Goddard Space Flight Center (USA)
- 3 Keynote Session II
 Harish M. Manohara, Jet Propulsion Laboratory (USA)
- 4 Complex MEMS
 Todd T. King, NASA Goddard Space Flight Center (USA)
 Mary J. Li, NASA Goddard Space Flight Center (USA)
- 5 Dip Pen Nanolithography
 Debjyoti Banerjee, Texas A&M University (USA)
 Gail J. Brown, Air Force Research Laboratory (USA)
- 6 Advanced MEMS Devices and Fabrication
 Orlando Auciello, Argonne National Laboratory (USA)
 Scott D. Collins, University of Maine (USA)
- 7 Nano-bio-info Technologies
 Ashok K. Sood, Magnolia Optical Technologies, Inc. (USA)
 Xuyuan Chen, Vestfold University College (Norway)
- 8 Biosensors
 Stephanie A. Getty, NASA Goddard Space Flight Center (USA)
 Romel D. Gomez, University of Maryland, College Park (USA)
- 9 Photonic Sensors
 Brian T. Cunningham, University of Illinois at Urbana-Champaign (USA)
 Reuven Gordon, University of Victoria (Canada)
- 10 Adaptive Optics
 Thomas G. Bifano, Boston University (USA)
 Scot S. Olivier, Lawrence Livermore National Laboratory (USA)

Introduction

Micro (MEMS) and Nanotechnologies for Space, Defense, and Security is an exciting conference, having successfully completed its third year of operation within the Space Technologies and Operations track at SPIE's Defense and Security Symposium. The combined fields of MEMS and nanotechnologies continue to be a vibrant area of research, as you will see from the papers selected for publication in this volume. The key challenge remains how to effectively transition these new concepts from the laboratory to system-level applications. Invited speakers from Texas Instruments and NASA's Goddard Space Flight Center addressed the complex engineering issues involved in converting laboratory-proven concepts into systems that perform reliably in the field. The key insight they provided is that although MEMS and Nanotechnology are the enablers for these next-generation systems, they form only a small portion of the ultimate systems that are fielded. Technology developers need to be made aware of the requirements driven by system-level design for a particular application environment and the intricacies of seamless integration with other sub-components in order to create the final product.

This year, we were also fortunate to have two keynote speakers from DARPA and the Army Research Laboratory, who laid out the roadmaps being pursued by their organizations vis-à-vis MEMS and nanotechnology research and development. In order to achieve the overall goal of successful transition from the laboratory to working product, it is critical that all of the stakeholders, such as the researchers, system developers, and program managers, are fully engaged in the technology transition process.

Among the emerging technologies that we were proud to showcase at this conference were nanowire- and nanotube-based devices, Dip Pen nanolithography, ultra nano crystalline diamond materials, biosensors, plasmonic sensors, and adaptive optics. The novel research presented in these fields is a testament to the diversity of MEMS and nanotechnology and its ability to impact a broad range of applications.

Thomas George
Zhongyang Cheng

Nano-Enabled Defense Opportunities

D. L. Polla

Defense Advanced Research Projects Agency, 3701 North Fairfax Drive, Arlington, VA

MEMS/NEMS have entered a new era characterized by: 1) Insertion of enabling Nanotechnologies, and 2) Heterogeneous integration of multiple technology building blocks. In particular, true systems advantages of MEMS are now being realized - often times through the subtle insertion of nanotechnologies. For instance, ultra miniature chip scale gas analyzers are now being realized through the heterogeneous integration of micro and nano fabricated sub-components such as chemical pre-concentrators, gas chromatographs, and mass spectrometers. Nanotechnology has enabled all of these key sub-components with advances such as carbon nanotube functionalization of surfaces, nanoelectronic field emitters, and nanodetectors. This talk will focus on several nano-enabled MEMS themes of interest to the Department of Defense and representative of a new direction for MEMS at DARPA.