

THE 33rd Annual
NORTHERN CALIFORNIA

ELECTRONIC MATERIALS SYMPOSIUM

A One-Day Symposium on Electronic Materials Featuring Outstanding Authorities in Their Respective Fields

TECHMART MEETING CENTER

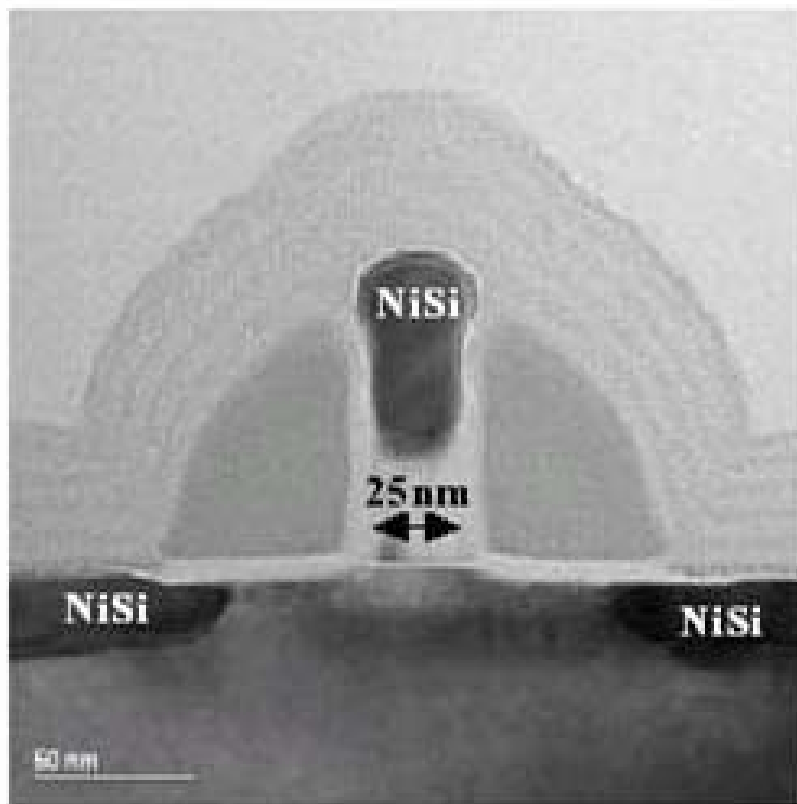
5201 Great America Parkway

Santa Clara, California 95054

Friday

April 22nd, 2005

8:30 AM



PROGRAM

8:00 Registration

MORNING SESSION

Session Chair: Prof. Gamani Karunasiri,
Naval Postgraduate School, Monterey, CA

- 8.30 **Welcome Remarks and Introduction**
Dr. Joachim Krueger, Chair
Agilent Technologies, San Jose, CA
- 8.40 *"Engineered Substrates and their Future Role in Microelectronics"*
Prof. Eugene Fitzgerald, MIT
- 9:25 *"Silicon applications to genomics."*
Dr. Andy Berlin, Intel
- 10:10 **REFRESHMENTS** (Vendor Exhibit Area)
- 10:40 *"Negative Refractive Index Materials"*
Dr. Angelo Mascarenhas, SERI
- 11:25 *"Electrochemical Plating of Cu Interconnect Structures for Microelectronics"*
Dr. John Dukovic, Applied Materials
- 12:10 **LUNCHEON**
- 1:10 **Luncheon Talk:** *"Climbing to Mars: Expedition to the World's Highest Lake to Explore a Primordial Mars Analog and Test NASA's Newest Medical Instruments"*
Prof. Greg Kovacs, Stanford University

AFTERNOON SESSION

Session Chair: Dr. Zhen Guo
Intel, Santa Clara, CA

- 1:55 *"Photovoltaics"*
Prof. Eicke Weber, UC Berkeley
- 2:40 **31st Annual Ross Tucker Memorial Awards**
7th Annual EMS Undergraduate Scholarship
- 2:50 **REFRESHMENTS** (Vendor Exhibit Area)
- 3:20 *"LEDs for Solid State Lighting: Technology, Applications, and the Remaining Challenges"*
Dr. George Craford, Lumileds
- 4:05 *"Organic Materials for Flexible Electronics"*
Prof. Zhenan Bao, Stanford University
- 4:50 **Closing remarks**
Dr. Joe Behnke, Vice-chair
Applied Materials, Santa Clara, CA
- 5:00 - **HOSTED COCKTAIL PARTY**
6:00 **VENDOR'S SHOW**

*Intel Corporation will host a mixer for interested applicants and managers
in the New Almaden room at 3 PM*

ABOUT THE SPEAKERS

Professor Zhenan Bao is an Associate Professor of Chemical Engineering, who came to Stanford after 8 years at Bell Labs, Lucent technologies as a Distinguished Member of Technical Staff. She received a M.S. in 1993 and a Ph.D. in 1995, both in Chemistry from the University of Chicago. In her research, she takes an interdisciplinary approach to address technologically important issues related to using organic materials for electronic devices. One of her major contributions has been the development of high performance organic semiconductors for large area flexible circuits and displays. Her current research interests include understanding of self-assembly at different length scales, using building blocks such as organic molecules and nano-objects. The devices of interest are chemical and biological sensors,

nanoelectronic devices, and molecular memories. She has more than 80 refereed publications 16 US patents. She currently serves as a member of Executive Board of Directors for the Materials Research Society and Executive Committee Member for the Polymer Materials Science and Engineering division of the American Chemical Society. She is an Editor for the Journal of Macromolecular Science, Part C - Polymer Reviews. She is a recipient of the American Chemical Society Team Innovation Award 2001, R&D 100 Award, and R&D Magazine's Editors Choice of the "Best of the Best" new technology for 2001. She has been selected in 2002 by the American Chemical Society Women Chemists Committee as one of the twelve "Outstanding Young Woman Scientist who is expected to make a substantial impact in chemistry during this

century". She is also selected by MIT Technology Review magazine in 2003 as one of the top 100 young innovators for this century. She has been selected as one of the recipients of Stanford Terman Fellow and has been appointed as the Robert Noyce Faculty Scholar and Finmeccanica Faculty Scholar.

Dr. Andy Berlin joined Intel's Microsystems Technology Department in 2000. He is currently a Sr. Principal Engineer in the Technology and Manufacturing Group (CTM), where he is leading the Intel Precision Biology research activity. Prior to joining Intel, Andy was a Principal Investigator at the Xerox Palo Alto Research Center, where he led a project that developed a meso-scale MEMS fabrication process and a MEMS-based microfluidic media handler that levitated paper on a bed of air. Andy received S.B., S.M., and Ph.D. degrees in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology, where he did work on the boundary of computer architecture and active structural control. Berlin holds 31 U.S. patents in the areas of MEMS and Smart Materials.

Dr. M. George Craford obtained a Ph.D. degree in physics from the University of Illinois in 1967. Craford began his professional career as a research physicist at Monsanto Chemical Company. He advanced to the level of Technical Director of the Electronics Division, before joining the Hewlett Packard Company in 1979. He is currently the Chief Technology Officer of LumiLeds Lighting, a joint venture of Agilent Technologies and Philips Lighting. Craford's research has been mainly focused on the development of visible LED's using a variety of compound semiconductor materials. He developed nitrogen-doped GaAsP technology in the early 1970's, which became one of the dominant commercial LED technologies. At Hewlett Packard, Craford's group pioneered the development of AlInGaP LED's, and has developed AlGaAs and InGaN products. Craford is a fellow of the IEEE and a member of the National Academy of Engineering. He has received technical achievement awards from a variety of organizations and received the 2002 National Medal of Technology from the President of the United States.

Dr. John Dukovic was born in Phoenixville, Pennsylvania and received a B.S. in chemical engineering at Case Western Reserve University in 1980. He studied electrochemical engineering with Charles Tobias at the University of California, Berkeley, receiving a Ph.D. in 1986. Dr. Dukovic then joined IBM's T.J. Watson Research Center, initially doing applied research in Luby Romankiw's Electrochemical Technology department on topics such as NiFe plating for magnetic recording, electrolyte-composition control, solder-ball fabrication, and thin-film packaging. He developed numerical models to interpret the behavior governing thickness uniformity, pattern-scale effects, and shape evolution in through-mask and Damascene plating. In the nineties, he participated with Panos Andricacos in the development of the Damascene plating process for IBM's copper chip-interconnect technology. From 1998 to 2002, Dr. Dukovic managed the Silicon Laboratory at IBM Yorktown. While at IBM, he co-taught a graduate-level course in electrochemical engineering at Columbia University and enjoyed participation in the

Electrochemical Society as an author, local-section chair, symposium organizer, and chair of the Electrodeposition Division. In 2002, Dr. Dukovic joined Applied Materials in Santa Clara, California, where he is presently Strategic Product Technologist in the Electrochemical Plating Division, responsible for advancing Applied's wafer-plating equipment and process technology. Dr. Dukovic has published 16 papers, largely on current distribution in electrodeposition for electronics, and is co-inventor on 11 U.S. patents, mainly covering plating equipment.

Prof. Eugene A. Fitzgerald is the Merton C. Flemings SMA Professor of Materials Engineering at the Massachusetts Institute of Technology. He received a BS degree in Materials Science and Engineering in 1985 from MIT, and a PhD in the same discipline from Cornell University in 1989. From 1989-1994, Prof. Fitzgerald performed research at AT&T Bell Laboratories in the area of semiconductors and devices. During his career at Bell Laboratories, Dr. Fitzgerald and colleagues demonstrated the first high mobility strained Si transistor in 1990. In 1994, Prof. Fitzgerald accepted an Associate Professor position in the Materials Science and Engineering Department at MIT, and in 2000 received a Lord Foundation Career Development Chair. In 1999, he became an SMA fellow in the Singapore-MIT Alliance. He became Full Professor in 2000 and received his current chair in 2003. His technology interests include electronic materials, novel semiconductor heterostructures and devices, and heteromaterial integration. He is also interested in the process of commercializing fundamental technology advances. He currently has 28 issued US patents with several pending, and has been author and co-author of more than 150 technical papers. In 1998, he founded AmberWave LLC, which became Amberwave Systems Corporation in 1999. AmberWave commercialized strained Si materials, processes, and devices that increase the performance of Si CMOS. He has previously held positions as Director, Chairman of the Board, and Chairman Emeritus at AmberWave. Prof. Fitzgerald is currently part of the founding team of Contour Semiconductor, a co-founder in 4Power LLC, and is founder of Paradigm Research LLC. Prof. Fitzgerald has served on the Editorial Board of Materials Science and Engineering Reports since 1995, and in 2003, he was elected to the Board of the Materials Research Society.

Prof. Gregory T. A. Kovacs received a BASc degree in electrical engineering from the University of British Columbia, an MS degree in bioengineering from the University of California, Berkeley, and a PhD in electrical engineering and an MD degree from Stanford University.

Prof. Kovacs is a long-standing member of the Defense Sciences Research Council (DARPA), and has served as Associate Chair and Chairman. He also has extensive industry experience including co-founding several companies, including Cepheid in Sunnyvale, CA. He is a Professor of Electrical Engineering at Stanford University with a courtesy appointment in the Department of Medicine. His present research areas include biomedical instruments and sensors, miniaturized spaceflight hardware, and biotechnology. He is the Director of Medical Device Technologies for the

Astrobiology Program at the NASA Ames Research Center, and Principal Investigator of the Stanford-NASA National Center for Space Biological Technologies. He helps direct a variety of projects spanning wearable physiologic monitors, biosensor instruments for detection of chemical and biological warfare agents and space biology applications, and free-flyer experiment payloads. In 2003, he served as the Investigation Scientist for the debris team of the Columbia Accident Investigation Board, having worked for the first four months after the accident at the Kennedy Space Center, Florida. In this role, he carried out physical, photographic, x-ray, chemical and other analyses on selected items from the nearly 90,000 pounds of recovered debris and worked toward understanding the nature of the accident. He currently serves as Engineering/Medical Liaison on the Spacecraft Crew Survival Integration Investigation Team (SCSIIT) of the Johnson Space Center.

Prof. Kovacs received an NSF Young Investigator Award, held the Noyce Family Chair, and was a Terman and then University Fellow at Stanford. He currently is the Thomas V. Jones Development Scholar in the School of Engineering. He is a Fellow of the American Institute for Medical and Biological Engineering. Kovacs is a private pilot, scuba diver, and a Fellow National of the Explorers Club. He was a member of a NASA and National Geographic Society sponsored team that climbed Licancabur volcano (19,734 ft.) on the Chile/Bolivia border in November of 2003, serving as medical, physiologic research, and photography lead. In November of 2004, he served the same role on a return expedition to Licancabur, and carried out medical research and underwater videography in the summit lake.

Dr. Angelo Mascarenhas is a Principal Scientist in the Center for Basic Sciences at NREL. He received his Ph.D in Experimental Solid State Physics from the University of Pittsburgh in 1986 and since then has been working at NREL in the area of spectroscopic research on photovoltaic materials for improved and advanced Solar Cells. He is currently the group leader for Solid State Spectroscopy. His research related to the consequences of spontaneous lateral composition modulation on the optical properties of short period superlattices helped

pioneer this very novel field. His current research focuses on the phenomenon of isoelectronic co-doping for tailoring the optical properties of semiconductor alloys, which he discovered, and its applications to very high efficiency solar cells, solid state lighting, and advanced communication lasers. He has over 200 research publications, is the editor of one book and two conference proceedings related to self-organized phenomena resulting from kinetic and thermodynamic instabilities in semiconductor alloys. He has authored several invited papers and book chapters as well as organized several symposia on these topics, and is a co-inventor on four patent applications.

Prof. Eicke Weber is Professor of Materials Science and Engineering at the University of California, Berkeley, and faculty investigator at the Lawrence Berkeley National Laboratory. He chairs the Nanoscale Science and Engineering Graduate Group and is the Director of the Integrated Materials Laboratory on the UC Berkeley campus. Further, he is the President of the German Scholar Organization. From 2001 to 2003, he was the President of the Alexander von Humboldt Association of America where he currently serves on the board of directors. He received his Ph.D. degree from the University of Cologne, Germany in 1976 and joined the Berkeley faculty in 1983.

Professor Weber's research is focused on the study of semiconductor materials problems, including silicon for photovoltaic and integrated circuit applications and III/V thin films and nanostructures, especially III-nitride films for applications in optoelectronics and high-speed devices. His research group uses MBE for thin film growth, a wide range of structural, optical and electrical characterization techniques, and processing of test devices in Berkeley's microfabrication laboratory. He has published more than 500 publications, edited 8 books, presented more than 50 invited talks at international conferences, and chaired several topical conferences in this field. He is co-editor of the Wiley book series 'Semiconductors and Semimetals.' In 1994 he received an Alexander von Humboldt Senior Scientist award. He is a fellow of the American Physical Society.

General Information

The Symposium registration covers admission to the Symposium sessions, abstracts of the Symposium presentations, luncheon, a vendor's exhibit, and a hosted cocktail hour following the Symposium. Physical limitations require the attendance to be limited to 200 registrants.

Costs of the Symposium have been kept to a minimum to encourage attendance. A discounted registration fee is available until April 1, 2005. To reserve your place in the Symposium and in the luncheon, we urge you to register early either on our website at <http://www.electronicmaterialssymposium.org> (preferred) or by mail, using the attached form. All registration is transferable but not refundable.

During the Symposium, the Ross N. Tucker Memorial Awards will be presented to two Bay Area graduate students in recognition of excellence in research. The EMS Undergraduate Awards will be presented to a Bay area undergraduate in recognition of excellent scholarship in electronic materials.

The Symposium features a Vendor's exhibit. Information and displays of new materials, processing equipment, characterization services, and analytical instruments will be presented by representatives of manufacturers. A special feature this year will be HR booths by a number of leading employers of materials scientists and engineers. Persons searching for jobs are encouraged to submit a resume.

A partially hosted cocktail hour will follow the Symposium presentations. This provides an opportunity for informal discussions with Symposium speakers, vendors and attendees.

Registration material and abstracts of the Symposium presentations will be provided at the registration booth.

The opening session will begin promptly at 8:30AM. Registration begins at 8:00AM. The vendors' area will be available for setup at 8:00AM.

Further questions regarding the Symposium should be directed to:

Dr. Joachim Krueger
Agilent Technologies, Wireless Semiconductor Division,
90TW, 350 West Trimble Road, San Jose, CA 95131
email: chair@electronicmaterialssymposium.org
408-435-4486

The Electronic Materials Symposium Committee exists to promote the understanding of electronic materials within the industrial and academic communities of the San Francisco Bay area. This committee organizes the annual Electronic Materials Symposium, featuring presentations on advanced electronic, magnetic and optical materials processing, characterization and devices by outstanding speakers who have made significant contributions to their fields. Proceeds of the symposium are used to support electronic materials research and education in local universities.

Symposium Committee

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Chapter

ABOUT THE COVER

The picture depicts a TEM cross-section of a 25nm physical gate length strained Si MOS transistor with NiSi.

The picture provided by Prof. Gene Fitzgerald, MIT, originally taken from: Q. Xiang, J.-S. Goo, H. Wang, Y. Takamura, B. Yu, J. Pan, A. Nayfeh, A. Holbrook, F. Arasnia, E. Paton, P. Besser, M. Sidorov, E. Adem, A. Lochtefeld, G. Braithwaite, M. Currie, R. Hammond, M. Bulsara, and M.-R. Lin, Proceedings of the First International SiGe Technology and Device Meeting, pp. 13-14 (2003).

**FOR ONLINE REGISTRATION: <http://www.electronicmaterialssymposium.org>
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Symposium Date: April 22 2005

Registration Fee

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Pre-Registration by April 1, 2005

\$110

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\$90

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Make checks payable to: Electronic Materials Symposium and send along with the above information to Dr. Joachim Krueger, Agilent Technologies, Wireless Semiconductor Division, 90TW, 350 West Trimble Road, San Jose, CA 95131. Any questions should be directed to Dr. Joachim Krueger at 408-435-4486, e-mail: chair@electronicmaterialssymposium.org. Please make sure your name and affiliation are clearly identified. The tax ID for the symposium is: 25-1484913. Registrations may be transferred/ substituted but are non-refundable.