



ASME
Nanotechnology
Institute

CONFERENCES



Nano/Bio: Engineering Trends and Applications Conference

■ April 3, 2003 ■ Portland, Oregon
www.asme.org/nano/bio



1st International Conference Fuel Cell Science, Engineering and Technology

■ April 21–23, 2003 ■ Rochester, New York
www.asme.org/fuelcell



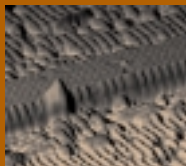
1st International Conference Microchannels and Minichannels

■ April 24–25, 2003 ■ Rochester, New York
www.asme.org/micromini



Nano Engineering and Investing Trends Conference

■ June 20, 2003 ■ NYU Stern School of Business ■ New York, New York
www.asme.org/nano/forum



Nano Training Bootcamp

■ July 8–11, 2003 ■ Northwestern University ■ Evanston, Illinois
www.asme.org/nano/bootcamp



Integrated Nanosystems 2003 Design, Synthesis & Applications

■ September 17–19, 2003 ■ Palo Alto, California
www.asme.org/nano

www.nanotechnologyinstitute.org



ASME International

TABLE OF CONTENTS

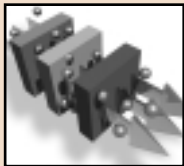
1



Nano/Bio: Engineering Trends and Applications Conference

■ April 3, 2003 ■ Portland, Oregon
www.asme.org/nano/bio

2-6



1st International Conference Fuel Cell Science, Engineering and Technology

■ April 21-23, 2003 ■ Rochester, New York
www.asme.org/fuelcell

7-12



1st International Conference Microchannels and Minichannels

■ April 24-25, 2003 ■ Rochester, New York
www.asme.org/micromini

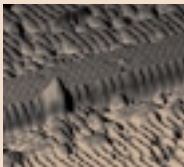
13



Nano Engineering and Investing Trends Conference

■ June 20, 2003 ■ NYU Stern School of Business ■ New York, New York
www.asme.org/nano/forum

14



Nano Training Bootcamp

■ July 8-11, 2003 ■ Northwestern University ■ Evanston, Illinois
www.asme.org/nano/bootcamp

15-17



Integrated Nanosystems 2003 Design, Synthesis & Applications

■ September 17-19, 2003 ■ Palo Alto, California
www.asme.org/nano

Nano/Bio: Engineering Trends & Applications Conference

April 3, 2003 Portland, Oregon

A forum to expose engineers, scientists, students and others (attorneys and members of the finance community) to the opportunities and challenges that nanotechnology and bioengineering promise.

PROGRAM

8:00am–8:30am	Registration & Networking
8:30am–8:40am	Welcome & Introduction <i>Conley and Gillard, ASME Oregon Section</i>
8:40am–9:10am	Keynote Address: Integrated Biotechnology: Linking Nano to Micro to Macro for Biomedical <i>Abe Lee, Department of Biomedical Engineering, University of California, Irvine</i>
9:10am–9:30am	Molecular Biomimetics: Functional Nanomaterials Assembly Using Genetically Engineered Proteins <i>Mehmet Sarikaya, University of Washington</i>
9:30am–9:50am	Mechanical Properties of Biological Materials <i>Don Anderson, University of Iowa</i>
9:50am–10:20am	Networking Break
10:20am–10:40am	Understanding Tissues at the Nano-scale & How to Use this Information in Engineering Design <i>David H. Kohn, University of Michigan</i>
10:40am–11:00am	Electrospinning Biomimicking Extracellular Matrices <i>Gary L. Bowlin, Virginia Commonwealth University</i>
11:00am–11:20am	Pacific Northwest National Laboratory Update Nano-biological Nano-Material-based Functional Designs to Meet DOE Needs <i>Paul E. Burrows, Donald R. Baer</i>
11:20am–Noon	Panel Discussion with Q & A <i>Lee, Sarikaya, Anderson, Kohn, Bowlin, Solanki</i>
Noon–1:30pm	Networking Lunch
1:30pm–1:50pm	Evolution of Microelectronics into Nanoelectronics <i>Raj Solanki, Department of Electrical and Computer Engineering Oregon Graduate Institute of the Oregon Health and Sciences University</i>
2:00pm–3:00pm	VC/Investor/Startup/Nanobio Panel <i>Debi Coleman, SmartForest Ventures; David Y. Chen, Gerard H. Langelier, OVP Venture Partners; William Newman, Northwest Technology Ventures</i>
3:00pm–4:30pm	Lab Tour

TOUR

Legacy Clinical Research and Technology Center Portland, Oregon

Visit this full-service, state-of-the-art research facility committed to excellence in support of the mission of the Legacy Health System. The Center contains 65,000 square feet of state-of-the-art laboratories, clinics, and an extensive support matrix, including a 9,500 square foot clinical research center dedicated to out-patient studies. Legacy Clinical Research and Technology Center supports a wide range of research activity, including clinical research, laboratory-based and preclinical studies.

COMPANY SHOWCASE

Firms facilitating the development of advanced technologies are invited to share their discoveries at the conference. Exhibit space is available as table-tops in the company showcase location. Enhance your company's leadership position and raise brand awareness by sponsoring activities. For further information please email: nano@asme.org.

VENUE

Portland Hilton & Executive Tower

921 Southwest Sixth Avenue
Portland, Oregon 97204
Tel : 503-226-1611
Fax: 503-220-2565
www.portland.hilton.com

If you require a sleeping room please contact the hotel for the best discounted rate and mention "ASME"

CONFERENCE RATES

\$45	Students
\$95	ASME, IEEE, AIChE Member, Academia, Not-for-profit, Govt.
\$125	Corporate

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/nano/bio

The 1st International Conference on Fuel Cell Science, Engineering and Technology

April 21–23, 2003 Rochester, New York

A forum for discussion on advances in the field of fuel cell systems and components for stationary, mobile and portable power generation applications and to further stimulate research activities in this emerging field.

Dear Colleague,

Welcome to the First International Conference on Fuel Cell Science, Engineering and Technology. As many of you know, fuel cell technology is an emerging technology for electric power generation for stationary, mobile and portable applications, having a far-reaching impact on our society. Some of the advantages of fuel cell systems are: high efficiency, unparalleled low emissions, quiet operation, and no large volume wastes. The major challenges are: how to reduce the high cost of power generation and large packaging requirement for vehicles, and how to improve performance, availability of suitable fuels, reliability and durability of the fuel cell stack and power plant. Since this technology has a great promise, it will have a major impact on the US and global economies. Currently, governments of all developed countries invest a significant amount of money for R&D, and many universities and technical institutes have developed special R&D programs and research centers related to some aspects of fuel cell technology.

The conference brings together researchers, experimentalists, analysts, designers, consultants, practitioners, and technology managers and leaders to exchange information, insights, and experiences in many research areas. Participants will discuss advances, identify barriers to technology development, and find ways to further stimulate their research activities.

This is your opportunity to learn from the experts about the latest advances in design, analysis, optimization, experimentation, manufacturing and development issues of the fuel cell systems and components in macro, micro and novel fuel cells. We will cover all major issues related to fuel cell and stack design, and balance of power plants that includes fuels and fuel reformers, air management, power delivery and cogeneration.

Some of the benefits of attending this conference are:

- Discover state-of-the-art fuel cell components and systems, including their types, functions and applications.
- Understand the advances in fundamentals of electrochemistry and thermodynamics of fuel cell operation.
- Find out the latest research in electrodes, membranes, catalysts, bipolar plates and stack constructions and operation.
- Get an in-depth understanding of advances in proton exchange membrane, direct methanol, alkaline, phosphoric acid, molten carbonate and solid oxide fuel cells as well as micro and novel fuel cells.
- Learn about developments in various fuels used and fuel processing issues for supplying hydrogen or hydrogen rich fuel to fuel cells.
- Find out the progress in fuel processor design, operation, and integration issues with fuel cells.
- Understand the state-of-the-art of hydrogen storage, infrastructure and safety issues for supply, transportation and use of hydrogen.
- Become familiar with improvements in design and operation of balance of fuel cell power plant.
- Gain knowledge of advances in fuel cell system integration and power delivery issues.
- Learn about the future trends and technology developments of fuel cell systems.

We look forward to your enthusiastic participation.

R.K. Shah and S.G. Kandlikar
Rochester Institute of Technology
Rochester, New York

TO REGISTER

For complete program details, travel and hotel information and to register, go to: **www.asme.org/fuelcell**

PROGRAM**SUNDAY, APRIL 20, 2003**4:00pm–7:00pm **Registration and Lab Tour**7:30pm–8:30pm **Welcome Reception****MONDAY, APRIL 21, 2003**8:20am–8:30am **Opening Ceremony**8:30am–10:30am **Proton Exchange Membrane Fuel Cell-Technology Advances and Opportunities**

PEM Fuel Cell – Applications, Challenges, and Future Prospects
J. Elter, PlugPower, Latham, New York

Development Considerations in the Commercialization of Fuel Cell Power Modules *P. Rivard, Hydrogenics, Mississauga, Ontario, Canada*

Fuel Cell Vehicles at a Road to Commercialization *W. Reinert, Toyota Motor Sales USA, Inc., Torrance, California*

10:30am–11:00am **Coffee/Tea Break**11:00am–12:30pm **General Topics Related to Fuel Cells**

Advanced Hydrogen Fuel Systems for Fuel Cell Vehicles *A.R. Abele, QUANTUM Fuel Systems Technologies WorldWide, Inc., Irvine, California*

Issues Affecting the Mechanical Integrity of Fuel Cells *R.P. Travis, Imperial College of Science and Technology, London, UK*

Temperature Measurement Technologies and Their Application in the Research of Fuel Cells *M.-H. Wang¹, H. Guo¹, C.-F. Ma¹, F. Ye¹, J. Yu¹, X. Liu¹, Y. Wang¹ and C.-Y. Wang²; ¹Beijing University of Technology, Beijing, China, ²Xi'an Jiaotong University, Xi'an, China, ³Pennsylvania State University, Pennsylvania*

Development of a Comprehensive Simulation Platform to Investigate System Interactions Among Solid-Oxide Fuel Cell, Power-Conditioning Systems, and Application Loads *S.K. Mazumder¹, R. Burra¹, K. Acharya¹, M. von Spakovsky², D. Nelson² and C. Haynes³; ¹University of Illinois, Chicago, IL; ²Virginia Tech, Blacksburg, VA; ³Georgia Tech Research Institute, Atlanta, Georgia*

Effect of Material and Manufacturing Variations on MEAs Pressure Distribution *K. Kelly¹, J. D'Aleo², J. Stathopoulos² and A. Vlahinos²; ¹National Renewable Energy Laboratory, Golden, Colorado; ²PlugPower, Latham, New York; ³Advanced Engineering Solutions LLC, Castle Rock, Colorado*

11:00am–12:30pm **Micro Fuel Cells – Science and Applications**

Fuel Cell Applications of Single Wall Carbon Nanotubes *R.P. Raffaele¹, T. Gennett¹, S. Morris², B. Dixon² and P. Lamarre³; ¹Rochester Institute of Technology, Rochester, New York; ²Phoenix Innovations, Inc., Wareham, MA; ³Viatronix, Inc., Waltham, Massachusetts*

Fabrication and Performance Evaluation of Miniaturized Proton Exchange Membrane (PEM) Fuel Cells *T. Zhang, P.-W. Li, Q.-M. Wang, M.K. Chyu and L. Schaefer, University of Pittsburgh, Pennsylvania*

A Novel Design and Microfabrication for a Micro PEMFC
C.W. Hong et al., National Tsing-Hua University, Taiwan

Investigation of Transport Phenomena in Micro Flow Channels for Miniature Fuel Cells *S.W. Cha, S.J. Lee¹, Y.I. Park and F.B. Prinz, Stanford University, Stanford, CA; ¹San Jose State University, San Jose, California*

The Role of Fuel Cells for Consumer Electronic Products and Toys
B. Banazwski and R.K. Shah, Rochester Institute of Technology, Rochester, New York

11:00am–12:30pm **Fuels and Fuel Reforming Technology**

Modeling of Reformers for Fuel Cell Applications *W.A. Rogers, S. Shi, D.A. Berry, T.H. Gardner and D. Shekhawat, U.S. Department of Energy, Morgantown, WV; ¹Fluent Incorporated, Morgantown, West Virginia*

Development of Natural Gas Reformer at ITRI *C.H. Lee, C.T. Lin, C.H. Huang, Y.C. Liu and H.S. Chu, Union Chemical Laboratories, ITRI, Taiwan*

Structured Catalysts for Autothermal Reforming of Hydrocarbon Fuels *J.-M. Bae, S. Ahmed, R. Kumar and E. Doss*

GlidArc-assisted Production of Synthesis Gas Through Propane Partial Oxidation *A. Czernichowski, M. Czernichowski and K. Wesolowska, Etudes Chimiques et Physiques (ECP), France*

GlidArc-assisted Production of Synthesis Gas Through Partial Oxidation of Natural Gas *A. Czernichowski and K. Wesolowska, Etudes Chimiques et Physiques (ECP), La Ferté Saint Aubin, France*

12:30pm–1:30pm **Lunch**1:30pm–3:30pm **Solid Oxide Fuel Cells – Prospects in Auto and Stationary Applications**

Solid Oxide Fuel Cells for Stationary Transportation and Military Applications *S. Singhal, Pacific Northwest National Lab (PNNL), Richland, West Virginia*

The Status and Prospect of Solid Oxide Fuel Cells for Stationary Power *S. Veyo, Siemens-Westinghouse Power Corporation, Pittsburgh, Pennsylvania*

3:30pm–4:00pm **Coffee/Tea Break**4:00pm–5:30pm **Heat/Mass Transfer/Flow Phenomena in Fuel Cells**

Parametric Study of Transport Phenomena in PEM Fuel Cells Using a 3D Computational Model *T. Berning and N. Djilali, University of Victoria, Victoria, British Columbia, Canada*

3D Modeling of Polymer Electrolyte Membrane Fuel Cells *S. Eldrid¹, M. Shahnam, M.T. Prinkey² and Z. Dong³; ¹Plug Power Inc., Latham, New York; ²Fluent Inc., Morgantown, West Virginia; ³General Electric Global Research Center, Niskayuna, New York*

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/fuelcell

A Simplified Three Dimensional CFD Approach for PEMFC and DMFC Design *C.W. Hong, C.H. Cheng and K. Fei, National Tsing Hua University, Hsinchu, Taiwan*

Gas Flow and Heat Transfer Analysis for an Anode Duct in Reduced Temperature SOFCs *J. Yuan, M. Rokni and B. Sundén, Lund Institute of Technology, Lund, Sweden*

Influence of Radiative Heat Transfer on Variation of Cell Voltage Within a Stack *A.C. Burt, I.B. Celik, R.S. Gemmen, A.V. Smirnov, West Virginia University, Morgantown, West Virginia*

4:00pm–5:30pm **Proton Exchange Membrane Fuel Cell Advanced Studies**

Fuel Cells vs. Competing Technologies *S. Srinivasan¹, L. Krishnan¹, A.B. Bocarsly¹, K-L. Hsueh², C-C. La², and A. Peng²; ¹Princeton University, Princeton, New Jersey; ²Industrial Technology Research Institute, Hsinchu, Taiwan*

Performance Modeling of PEM Fuel Cell Operated on Reformate *T. Zhou and H. Liu, University of Miami, Coral Gables, Florida*

Study on Morphological Properties and Mass Transport Parameters of ORR in Recast Ion-exchange Polymer Electrolyte Membranes *K. Lee, A. Ishihara¹, S. Mitsushima, N. Kamiya and K.-I. Ota, Yokohama National University, Yokohama, Japan; ¹CREST-JST, Japan*

Development of PEMFC Systems for Space Power Applications *K. McCurdy, A. Vasquez, and K. Bradley, National Aeronautics and Space Administration, Houston, Texas*

Out-of-Cell Evaluation of Oxygen Reduction Kinetics on Carbon Supported Pt and Pt Alloys *P. Yu, M. Pemberton, J. Bett, and S. Bugaj, UTC Fuel Cells, South Windsor, Connecticut*

4:00pm–5:30pm **Novel Fuel Cells**

Membraneless Fuel Cell Based on Laminar Flow *E.R. Choban, P. Waszczuk, L.J. Markoski, A. Wieckowski, and P.J.A. Kenis, University of Illinois at Urbana-Champaign, Urbana, Illinois*

A Silicon Microfabricated Direct Formic Acid Fuel Cell *G.Z. Mozsgai, J. Yeom, A. Asthana, B.R. Flachsbar, P. Waszczuk, E.R. Choban, P.J.A. Kenis, and M.A. Shannon, University of Illinois, Urbana, Illinois*

Oxygen – Aluminum Fuel Cells and Most Practical Fields of Their Application *A.A. Farmakovskaya, V.V. Popov, S.D. Sevruck and V.G. Udaltsov, Moscow Aviation Institute (MAI), Moscow, Russia*

Fabrication of Micro-Actuated Galvanic Cells as Power on Demand for Lab on a Chip Applications by Means of Novel PCB/MEMS Technology *A.M. Cardenas-Valencia, D.P. Fries, G. Steimle, H. Broadbent, L.C. Langebrake and R.F. Benson, University of South Florida, Tampa, Florida*

Fabrication of Miniature Silicon Wafer Fuel Cells Using Micro Fabrication Technologies *J. Yu, P. Cheng, Z. Ma and B. Yi¹, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong; ¹Chinese Academy of Sciences, Dalian, People's Republic of China*

6:00pm–8:00pm **Reception and Banquet**

8:00pm–9:00pm **Banquet Presentation**

TUESDAY, APRIL 22, 2003

8:30am–10:30am **Molten Carbonate Fuel Cells – A Promising Stationary Power Generation Technology**

Fuel Cells: What's Up Next *K. Hemmes, Delft University of Technology, Delft, The Netherlands*

Status of Direct Carbonate Fuel Cell Development *H. Ghezel-Ayagh, A.J. Leo, H. Maru, and M. Farooque, Fuel Cell Energy, Inc., Danbury, Connecticut*

Development of High Efficiency MCFC/GT Hybrid Power Generation System *T. Watanabe, Central Research Institute of Electric Power Industry (CRIEPI), Yokosuka-shi, Kanagawa, Japan*

10:30am–11:00am **Coffee/Tea Break**

11:00am–12:30pm **Panel on Codes and Standards for Fuel Cell Systems** *Session Chair: D.R. Frikken, P.E., Solutia, Inc., Gerald, Missouri*

N. Rossmeissl, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Hydrogen Fuel Cells and Infrastructure Technologies, Washington, DC.

S. Staniszewski, U.S. Department of Transportation, Research & Special Programs Administration, Office of Hazardous Materials Safety, Washington, DC.

J. Koehr, Codes and Standards Technology Institute, The American Society of Mechanical Engineers, New York, New York

12:30pm–1:30pm **Lunch**

1:30pm–3:30pm **Fuels and Fuel Processing – A Success for Fuel Cell Technology**

Providing and Processing Fuel *A.L. Dicks, The University of Queensland, Brisbane, Queensland, Australia*

Fuel Processing for Mobile Systems *M. Krumpelt, Argonne National Lab, Argonne, Illinois*

A Review of Hydrogen Production Technologies *Y. Goswami, University of Florida, Gainesville, Florida*

3:30pm–4:00pm **Coffee/Tea Break**

4:00pm–5:30pm **Thermodynamic Analysis Modeling and Simulation in Fuel Cells**

Some Aspects of Mass Transfer within the Passage of Fuel Cells *S.B. Beale, National Research Council, Ottawa, Ontario, Canada*

Exergy Analysis of Polymer Electrolyte Fuel Cell Systems Using Methanol *A. Ishihara¹, S. Mitsushima, N. Kamiya and K.-I. Ota, ¹Japan Science and Technology Corporation (JST), Yokohama National University, Japan*

Thermodynamic Modeling and Performance Analysis of a Power Generation System Based on the Solid Oxide Fuel Cell *B.-H. Bae, J.L. Sohn and S.T. Ro, Seoul National University, Seoul, Korea*

Advancing Fuel Cells Technology via Analogous Heat Exchanger Design Principles *C. Haynes, Georgia Tech, Atlanta, Georgia*

4:00pm–5:30pm **Molten Carbon Fuel Cells**

State of the Art About the Effects of Impurities on MCFCs and Pointing Out of Additional Research for Alternative Fuel Utilization *U. Desideri, P. Lunghi and R. Burzacca, Università di Perugia, Perugia, Italy*

Highly Efficient Electricity Generation from Solid Fuels – Thanks to Integration of a Gasification Process within a Hybrid Fuel Cell and Gas Turbine Plant *P. Lunghi and R. Burzacca, University of Perugia, Perugia, Italy*

System Integration and Optimization of Molten Carbonate Fuel Cell System Using Process Integration *H. Shihni¹ and R.K. Shah²; ¹State University of New York at Buffalo, Buffalo, New York; ²Rochester Institute of Technology, Rochester, New York*

An Investigation of DIR-MCFC Based Cooling, Heating and Power System *I. Samanta and R.K. Shah, Rochester Institute of Technology, Rochester, New York*

4:00pm–5:30pm **Balance of Power Plant of Fuel Cell Systems**

Assessing the Impact of Inverter Current-Ripple on SOFC Performance *R.S. Gemmen, U.S. Department of Energy, Morgantown, West Virginia*

Innovative Thermal Management of Fuel Cell Power Electronics *K. Kelly¹ and A. Vlahinos²; ¹National Renewable Energy Laboratory, Golden, Colorado; ²Advanced Engineering Solutions LLC, Castle Rock, Colorado*

Investigation of a Novel Reciprocating Compression Reformer for Use in Solid Oxide Fuel Cell Systems *A.N. Zinn¹, T.H. Gardner², D.A. Berry³, R.E. James³, D. Shekhawat³; ¹REM Engineering Services, Morgantown, West Virginia; ²U.S. Department of Energy, Morgantown, West Virginia*

Oil-Free High-Speed Centrifugal Compressor for Automotive Fuel Cells *J.F. Walton II and H. Heshmat, Mohawk Innovative Technology, Inc., Albany, New York*

Floating Scroll Technology for Fuel Cell Air Management System *S. Ni, Scroll Laboratories Inc., Romeoville, Illinois*

6:00pm–8:00pm **Reception and Banquet**

8:00pm–9:00pm **Banquet Presentation**

WEDNESDAY, APRIL 23, 2003

8:30am–10:30am **Basic Research Needs in Fuel Cell Technology – Challenges and Opportunities**

Techno-Economic Challenges for PEMFCs & DMFCs Entering Energy Sector *S. Srinivasan, Princeton University, Princeton, NJ; Presentation to be made by K-L. Hsueh, Industrial Technology Research Institute, Hsinchu, Taiwan*

Perspectives on the Use of Molten Carbonate Fuel Cells with Renewable Energy Sources *U. Desideri, University of Perugia, Perugia, Italy*

Solid Oxide Fuel Cells – Opportunities and Challenges *A. Virkar, University of Utah, Salt Lake City, Utah*

10:30am–11:00am **Coffee/Tea Break**

11:00am–12:30pm **Automotive Fuel Cell Applications**

Systems Analysis of Diesel Based Fuel Cells for Auxiliary Power Units *D.A. Berry, R. James, T.H. Gardner, and D. Shekhawat, U.S. Department of Energy, Morgantown, West Virginia*

Regulations Governing Transportation of Portable Fuel Cell Devices and Systems in Mass Transportation Systems *E.U. Ubong and K.J. Berry, Kettering University, Flint, Michigan*

Circumventing the Challenges of Fuel Cell Powered Automobiles *J.E. Gover, Kettering University, Flint, Michigan*

An Engineering System for Automated Design and Optimization of Fuel Cell Powered Vehicles *G. Willis¹, R. Weller¹, K. Wipke² and T. Marke²; ¹Vulcanworks LLC, Ann Arbor, MI; ²National Renewable Energy Laboratory, Golden, Colorado*

Sensitivity Analysis of Water Balance, Operating Temperature and Pressure for a PEM Fuel Cell System in Automotive Drive Cycles *K. Haraldsson, T. Markel and K. Wipke, National Renewable Energy Laboratory, Golden, Colorado*

11:00am–12:30pm **Heat/Water/Temperature Balance in PEM Fuel Cells**

Modeling of Two-Phase Flow in a Cathode Duct of PEM Fuel Cells *J. Yuan, M. Rokni and B. Sundén, Lund Institute of Technology, Lund, Sweden*

Heat and Mass Transfer and Two Phase Flow in Hydrogen Proton Exchange Membrane Fuel Cells and Direct Methanol Fuel Cells *H. Guo^{1,2}, C.-F. Ma¹, M.-H. Wang¹, J. Yu¹, X. Liu¹, F. Ye¹ and C.-Y. Wang³; ¹Beijing University of Technology, Beijing, China; ²Xi'an Jiaotong University, Xi'an, China; ³Pennsylvania State University, Pennsylvania*

Water and Thermal Balance in PEM Fuel Cells *M.G. Izenson and R.W. Hill, Creare Incorporated, Hanover, New Hampshire*

The Influence of Water and Thermal Conditions on the Performance of PEM Fuel Cell *Y.Y. Yan, L.Y. Sung, K.C. Tsay, H.S. Chu and R.J. Shyu, Energy and Resources Laboratories, ITRI, Taiwan*

System Integration for PEM Fuel Cell with Thermal Conditions on the Water and Heat Recovered *Y.Y. Yan, G.S. Chen, H.S. Chu, F.S. Tsu and R.J. Shyu, Energy and Resources Laboratories, ITRI, Taiwan*

11:00am–12:30pm **Advances in Solid Oxide Fuel Cell Technology**

Metal-Supported Solid Oxide Fuel Cells for Operation at Temperatures of 500-650° *C.A. Atkinson, S. Baron, N.P. Brandon¹, A. Esquirol, J.A. Kilner, N. Oishi, R. Rudkin and B.C.H. Steele¹; Imperial College London, London, UK; ¹Ceres Power Ltd, Crawley, UK*

The Vision for Solid Oxide Fuel Cells: Development of a SOFC APU for the Transportation Industry *S. Mukerjee and C. De Minco, Delphi Corporation, Technical Center, Rochester, New York*

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/fuelcell

Improved Multi-Functionality of Ni/YSZ Cermet Anode by Optimizing Fabrication Processes *H.S. Song, J.-H. Lee, J. Kim, S.-W. Kim and H.-W. Lee, Korea Institute of Science and Technology, Seoul, Korea*

Validation and Application of a CFD-Based Model for Solid Oxide Fuel Cells and Stacks *W.A. Rogers, R.S. Gemmen, C. Johnson, M. Prinkey¹ and M. Shahnam¹, U.S. Department of Energy, Morgantown, West Virginia; ¹Fluent Incorporated, Morgantown, West Virginia*

Development of a Comprehensive Numerical Model for Analyzing a Tubular-Type Indirect Internal Reforming SOFC *T. Nishino, H. Komori, H. Iwai and K. Suzuki, Kyoto University, Kyoto, Japan*

12:30pm–1:30pm **Lunch**

1:30pm–3:30pm **Industry, Government and Academia Partnership and Funding Opportunities**

US Army Small Fuel Cell Development Program *A.S. Patil, US Army Communications-Electronics Command, Fort Belvoir, VA.*

U.S. Distributed Generation Fuel Cell Program *M.C. Williams, National Energy Technology Laboratory, DOE, Washington, DC.*

An Overview of NYSERDA's Distributed Generation Program *M.R. Torpey, New York State Energy Research and Development Authority (NYSERDA), Albany, New York*

3:30pm–3:40pm **Closing Ceremony**

3:40pm **Reception**

TOUR

Participants will view RIT's Micro Fuel Cells Lab, the Remanufacturing Lab, and the Clean Room Lab. Offered to the first 100 registered participants on Sunday, April 20.

COMPANY SHOWCASE

Firms facilitating the development of fuel cell technology are invited to share their discoveries at the conference. Exhibit space is available as table-tops in the company showcase location. Enhance your company's leadership position and raise brand awareness by sponsoring activities. For further information please email: fuelcell@asme.org.

Exhibitors (as of 2/03)

- Iwaki Walchem – manufactures sealless magnetic drive pumps for stack temperature control applications, drain and fuel feed. Pumps are available with DC brushless or brushed motors in 12, 24 and 48 volt and AC motors. Select pump casings designed to reduce parasitic loss and conserve energy. Pump bearing systems are designed to maximize service life and reduce maintenance costs.

- COMSOL – makers of FEMLAB, multiphysics modeling software for engineering simulation and virtual prototyping in application areas such as fuel cells, MEMS, CFD, chemical reactions, electromagnetics, and structural mechanics. FEMLAB, which is based on MATLAB, provides a complete FEA package with a unique equation-based modeling approach that allows for fully coupled multiphysics modeling in 2D and 3D.

- Advanced Materials Technologies (AMT) is an ISO9002 and QS9000 certified metal and ceramic injection molding solutions provider. AMT has the materials and know-how to make advanced designs affordable and is committed to offering quality products and services, delivered on time. AMTellec, AMT's U.S. subsidiary, provides customer support and product development services that support customers from concept to commercialization.

VENUE

R.I.T. Inn & Conference Center

5257 W. Henrietta Road

Rochester, NY 14602

Tel : 585-359-1800

Fax:585-359-1349

www.ritinn.com

Be sure to mention the ASME & RIT conference to obtain this special rate!

The R.I.T. Inn, provides complimentary airport shuttle service from Greater Rochester International Airport (12 miles). Complimentary telephones to R.I.T. Inn are located in the baggage claim area of the airport. To arrange a pick-up, call the hotel when you get to the baggage claim area.

Taxi cabs will cost approximately \$25-\$27 and take about 20 minutes.

CONFERENCE RATES

\$525 Conference Rate

\$135 Spouse (access to opening reception and all banquets)

SCIENTIFIC COMMITTEE

Conference Chair: Ramesh K. Shah

Conference Co-Chair: Satish G. Kandlikar

Steven B. Beale; Ping Cheng; Nedjib Djilali; Leonardo Giorgi; Abel Hernandez-Guerrero; Sang Yong Lee; Anthony Leo; Chong-Fang Ma; Subhasish Mukerjee; Hans Müller-Steinhagen; Kazuo Onda; Ken-ichiro Ota; Terry Penny; Ruey-Jong Shyu; Prabhakar Singh; Bengt Sundén; Bernard Thonon; Hossein Toghiani; Anil V. Virkar; Gerald Voecks

The 1st International Conference on Microchannels and Minichannels

April 24–25, 2003 Rochester, New York

This Conference is a platform for researchers to exchange information and identify research needs in this emerging area encompassing many engineering and medical disciplines. It covers fluid flow, heat transfer and mass transfer issues related to flow in passages 10 micrometer to about 3 mm. Topics related to single phase, flow boiling, flow condensation, microfluidics, instrumentation and control, fuel cells, simulation and modeling, and specific applications including nuclear, biomedical, MEMS devices, novel systems, etc. are appropriate for the conference.

Dear Colleague:

As the need for more compact fluid flow and heat exchange devices becomes more critical, reduction in passage dimensions provides clear possibilities in meeting these challenges. However, the fluid flow and heat transfer issues associated with the small channels are currently not well understood.

Use of microchannels and minichannels is becoming more common in many technologies. Fuel cell passages, refrigeration systems, electronic chip cooling, fluid flow through membranes, blood flow in organs such as kidneys, lungs and brain, DNA analysis, and in many other devices, fluid flow is encountered in channels that are only a few tens of micrometers to 2-3 mm in hydraulic diameter. These passage dimensions are covered classified as MICROCHANNELS (under 200 micrometers) and MINICHANNELS (up to 3 mm).

A number of issues are being encountered in which we need to understand the underlying fluid flow and heat and mass transfer processes. Single-phase flow with gases would encounter rarefaction effects toward the lower end of the diameters, while the nature of two-phase flow in boiling and condensation is little understood in such small passages.

In order to advance our knowledge regarding the fundamental characteristics, and set future research directions, we are planning this First International Conference on Microchannels and Minichannels. In this gathering of experts from all over the world, with over twelve keynote speakers, and many papers on both fundamental and applications, we hope to bring out the research needs in these areas to set our research directions related to a number of emerging technologies.

We invite you to participate in this exciting event, as an author presenting a paper on any aspects related to microchannels and minichannels, or as a participant in helping us understand needs in your specific application.

I look forward to your enthusiastic participation.

Sincerely,

Satish G. Kandlikar (USA)
Conference Chair

Gian Piero Celata (Italy), Bernard Thonon (France), Peter Stephan (Germany), Shigefumi Nishio (Japan)
Conference Co-chairs

Scientific Committee

S.G. Kandlikar, USA, Chair, sgkeme@rit.edu
G.P. Celata, Italy, Co-Chair, celata@casaccia.enea.it
S. Nishio, Japan, Co-Chair, nishios@iis.u-tokyo.ac.jp
P. Stephan, Germany, Co-Chair, pstephan@ttd.tu-darmstadt.de
B. Thonon, France, Co-Chair, thononbe@chartreuse.cea.fr
B. Cesna, Lithuania, benas@isag.lei.lt
Ping Cheng, Hong Kong, mepcheng@ust.hk
V.K. Dhir, USA, vdhir@seas.ucla.edu
P. Di Marco, Italy, p.dimarco@ing.unipi.it
Y. Fujita, Japan, fujita@mech.kyushu-u.ac.jp
Z.Y. Guo, China, demgzy@tsinghua.edu.cn
S. V. Garimella, USA, garimell@iastate.edu
W.J. Grande, USA, wjgemc@ritvax.isc.rit.edu
G. Hetsroni, Israel, hetsroni@techunix.technion.ac.il
P. Hrnjak, USA, pega@ntx1.cso.uiuc.edu
M. Jensen, USA, jensem@rpi.edu

M. Kawaji, Canada, kawaji@chem-eng.utoronto.ca
M.H. Kim, S. Korea, mhkim@postech.ac.kr
M.R. King, USA, mike_king@urmc.rochester.edu
S. Koyama, Japan, koyama@cm.kyushu-u.ac.jp
V.V. Kuznetsov, Russia, vladkuz@itp.nsc.ru
S.Y. Lee, S. Korea, e_hyunny@cais.kaist.ac.kr
Zhi-Xin Li, China, lizhx@tsinghua.edu.cn
A. Majumdar, USA, majumdar@maxwell.berkeley.edu
M. Ozawa, Japan, ozawa@kansai-u.ac.jp
J. Pettersen, Norway, jostein.pettersen@sintef.no
J. Rose, UK, j.w.rose@qmul.ac.uk
R. Shah, USA, rkshah@attglobal.net
M. Shoji, Japan, shoji@photon.t.u-tokyo.ac.jp
W.Q. Tao, China, wqtao@xjtu.edu.cn
Anatoly V. Soudarev, Russia, soudarev@boykocenter.spb.ru
V. Wadekar, UK, vishwas.wadekar@aspentech.com

PROGRAM

THURSDAY, APRIL 24, 2003

8:00am–10:00am

Session 1-A-1

Introduction Ceremony

Welcome from ASME, RIT, Conference Chair and Co-Chairs: S.G. Kandlikar, USA; P. Stephan, Germany; G.P. Celata, Italy; S. Nishio, Japan; B. Thonon, France
Session Chair: S. Nishio, University of Tokyo, Tokyo, Japan; P. Stephan, University of Darmstadt, Germany

Opening Remarks

Microchannels and Minichannels – History, Terminology, and Classification *S. Kandlikar, Rochester Institute of Technology, Rochester, NY, USA*

Keynote: Minichannel Heat Transfer: An Overview on Activities in Europe *M. Groll, University of Stuttgart, Germany; R. Mertz, University of Stuttgart, Germany*

Keynote: Micro Thermal Systems in France: From Knowledge to Technology Development *B. Thonon, CEA-Greth, France; P. Marty, University Joseph Fourier, France*

Keynote: Microchannel Research in Sweden *B. Palm, Royal Institute of Technology, Stockholm, Sweden*

Keynote: A Study Of Condensation Heat Transfer In A Single Mini-tube And A Review Of Korea Micro- and Mini-channel Studies *M.H. Kim, J.S. Shin, C. Huh, T.J. Kim, K.W. Seo, Pohang University of Science and Technology, Korea*

Keynote: Recent Work on Transport Phenomena in Microsystems at HKUST *P. Cheng, Hong Kong University of Science and Technology, Hong Kong*

10:15am–12:15pm

Session 1-B-1 *Session Chair: CG. P. Celata, ENEA – Institute of Thermal-Fluid Dynamics, Rome, Italy*

Keynote: Heat Transfer Mechanism during Flow Boiling in Microchannels *S. Kandlikar, Rochester Institute of Technology, Rochester, NY, USA*

Flow Boiling Heat Transfer of R-22 in Small-Diameter Horizontal Round Tubes *K.S. Park, J.M. Kim, K.H. Bang, Korea Maritime University, Korea*

Flow Boiling Pressure Drop Modeling in a Minichannel *D. Brutin, L. Tadrist, Ecole Polytechnique Universitaire de Marseille, France*

Marangoni Convection in Capillary Tubes Filled with Volatile Liquids *C. Buffone, K. Sefiane, University of Edinburgh, United Kingdom*

Mathematical Modeling of Constrained Vapor Bubbles in Microchannels *V.S. Ajaev, Southern Methodist University, USA; G.M. Homsy, University of California, USA*

Restriction of Critical Heat Flux by Critical Flow Condition in Capillary Tube *H. Umekawa, M. Ozawa, Kansai University, Japan; T. Sanami, Sumitomo Special Metals, Japan*

10:15am–12:15pm

Session 1-B-2 *Session Chair: J. Rose, University of London, United Kingdom*

Keynote: Condensation Of Refrigerant In Multi-Port Channel *S. Koyama, Kyushu University, Fukuoka, Japan*

Testing of A Microchannel Partial Condenser and Phase Separator In Reduced Gravity *W.E. TeGrotenhuis and V. S. Stenkamp, Battelle Memorial Institute, Richland, WA, USA*

Condensation Heat Transfer on Micro-Grooved Polymer Film Surface *Y. Wang, G.P. Peterson, Rensselaer Polytechnic Institute, Troy, NY, USA*

Observation of Low Bond Number Two-Phase Flow Regime Transition from Slug to Annular Wavy Flow in a Microchannel *S.Y. Son, J.S. Allen, NASA, Cleveland, OH, USA*

Two-Phase Flow Patterns In A Square Micro-Channel *J.F. Zhao, B. Li, Chinese Academy of Sciences, Beijing, China*

Influence of Vertical Return Bend on the Two-phase Flow Pattern in a 3-mm Minichannel *I.Y. Chen, National Yunlin University of Science and Technology, Taiwan; C.-C. Wang, Industrial Technology Research Institute, Hsinchu, Taiwan; P.-S. Huang, National Yunlin University of Science and Technology, Taiwan; B.-C. Yang, Industrial Technology Research Institute, Hsinchu, Taiwan; Y.-J. Chang, Industrial Technology Research Institute, Hsinchu, Taiwan*

10:35am–12:15pm

Session 1-B-3 *Session Chair: Z.-X. Li, Tsinghua University, China*

A Microchannel Flow and Heat Transfer Study by Lattice Boltzmann Method *R. Yang, C.-S. Wang, National Sun Yat-Sen University, Kaohsiung, Taiwan*

Gas Flow Studies in MEMS using Lattice Boltzmann Method *G. H. Tang, W.Q. Tao, Y. L. He, Xi'an Jiaotong University, China*

Examination of the LBE Method in Simulation of the Microchannel Flow in Transitional Regime *C. Shen, D. B. Tian, C. Xie, J. Fan, Chinese Academy of Science, Beijing, China*

Statistical Simulation of Non-Circular Cross Section Poiseuille Flows *J.-Z. Jiang, C. Shen, J. Fan, Chinese Academy of Science, Beijing, China*

Multiplicity of Mixed-Convection Heat Transfer in Microchannels *L.Q. Wang, Hong Kong University, Hong Kong*

1:15pm–2:55pm

Session 1-C-1 *Session Chair: S. V. Garimella, Iowa State University, Ames, IA, USA*

Keynote: Convective Boiling in Parallel Micro-channels *G. Hetsroni, D. Klein, A. Mosyak, Z. Segal, E. Pogrebnyak, Technion-Israel Institute of Technology, Technion City, Haifa, Israel*

Two-Phase Boiling Flow in Microchannels: Instabilities and Flow Regime Mapping *Y. Peles, Rensselaer Polytechnic Institute, Troy, NY, USA*

Hysteresis Phenomena at the Onset of Subcooled Nucleate Flow Boiling in Microchannels *M. Piasecka, M.E. Poniewski, Kielce University of Technology, Poland*

Flow Boiling of R-134a in Minichannels with Transverse Ribs *M. Molki, P. Mahendra, V. Vengala, Southern Illinois University, Edwardsville, IL, USA*

Two-phase flow Instability of Boiling in a Double Micro-channel System at High Heating Power *H.Y. Li, P.C. Lee, F.G. Tseng, C. Pan, National Tsing Hua University, Hsinchu, Taiwan*

1:15 pm–2:55pm **Session 1-C-2** *Session Chair: B. Thonon, CEA-Greth, France*

Keynote: Advanced Capillary Structures For High Performance Heat Pipes *P. Stephan, University of Darmstadt, Germany*

Heat Pipe Performance Enhancement for Microelectronics Cooling *C. Buffone, University of Edinburgh, United Kingdom; L. Buffone, K. Sefiane, University of Edinburgh, United Kingdom; S. Lin, Thermacore Europe Ltd, United Kingdom; M. Bradley, Praxair Surface Technologies, United Kingdom*

Test Facilities for a Continuous Transition From Mini- to Microchannels *H. Herwig, O. Hausner, TU Hamburg, Harburg, Germany*

Industrial Microchannel Devices – Where Are We Today? *L.M. Pua, S.O. Rumbold, Heatric Division, Meggitt Ltd, Poole, Dorset, United Kingdom*

Channel-To-Channel Pressure Differences In Serpentine Microchannel Flow Systems *P.H. Oosthuizen, M. Austin, Queen's University, Canada*

1:15pm–2:55pm **Session 1-C-3** *Session Chair: S. Boedo, Rochester Institute of Technology, Rochester, NY, USA*

Keynote: Some Flow and Thermal Phenomena at Microscale *Z.-X. Li, Z.-Y. Guo, Tsinghua University, Beijing, China*

Numerical Simulation on Micro Flow Through PCR Chip *W. Wang, Z.-X. Li, Z.-Y. Guo, Tsinghua University, China*

Experimental Investigation of Single-Phase Flow Pressure Drop Through Rectangular Microchannels *X. Tu, P. Hrnjak, University of Illinois at Urbana - Champaign, IL, USA*

The Effects of Viscous Heat Dissipation on Convective Heat Transfer in Small-Scale Slipping Gaseous Flows *N. Hadjiconstantinou, MIT, Cambridge, MA, USA*

Analytical Results for Sound Wave Propagation in Small-Scale Channels *N. Hadjiconstantinou, MIT, Cambridge, MA, USA*

3:35pm–5:15pm **Session 1-D-1** *Session Chair: H. Umekawa, Kansai University, Japan*

Keynote: Single-Phase Heat Transfer and Fluid Flow in Micropipes *G.P. Celata, ENEA–Institute of Thermal–Fluid Dynamics, Italy*

Characteristics of Water Flow in a Vertical Micro Tube *X. Wang, M. Watanabe, M. Shoji, University of Tokyo, Japan*

Review of Flow Boiling Heat Transfer with Mixtures in Small and Mini Channels *L. Cheng, South Bank University, United Kingdom; K. Sefiane, T.G. Karayiannis, University of Edinburgh, United Kingdom*

Two Large-Amplitude/Long-Period Oscillating Boiling Modes in Silicon Microchannels *H.Y. Wu, P. Cheng, Hong Kong University of Science and Technology, Hong Kong*

Pressure Drop in a Capillary Tube on Boiling Two-phase Flow *F. Kaminaga, B. Sumith, K. Matsumura, Ibaraki University, Japan*

Upflow Boiling and Condensation in Rectangular Minichannels *V. V. Kuznetsov, Institute of Thermophysics, Russian Academy of Sciences, Russia; S. V. Dimov, Institute of Thermophysics, Russian Academy of Sciences, Russia; P. A. Houghton, Air Products and Chemicals, Inc., Allentown, PA, USA; A.S. Shamirzaev, Institute of Thermophysics Russian Academy of Sciences, Russia; S. Sunder, Air Products and Chemicals, Inc., Allentown, PA, USA*

3:15pm–5:15pm **Session 1-D-2** *Session Chair: P. Stephan, Darmstadt University of Technology*

Keynote: Two-Phase Patterns During Microchannel Vaporization Of CO₂ At Near-Critical Pressure *J. Pettersen, Norwegian University of Science and Technology (NTNU), Norway*

Two-phase Pressure Drop of CO₂ in Mini Tubes and Microchannels *R. Yun, Y. Kim, Korea University, Seoul, Korea*

Hydrodynamically Developing Dual-Wall-Driven Microchannel Flow *J. Tenny, D. Maynes, B.W. Webb, Brigham Young University, UT, USA*

Characterization Of The Hydrodynamically Developing Flow In A Microtube Using Molecular Tagging Velocimetry *B. Thompson, D. Maynes, B.W. Webb, Brigham Young University, UT, USA*

Heat Transport Limitation Of A Triangular Micro Heat Pipe, *D. Sugumar, T.K. Kiong, National Technical University, College of Malaysia, Malaysia*

3:15pm–5:15pm **Session 1-D-3** *Session Chair: V. K. Dhir, University of California at Los Angeles, CA, USA*

Keynote: Formation Of Dispersions Using Flow Focusing In Microdevices *S.L. Anna, Harvard University, Cambridge, MA, USA; N. Bontoux, Ecole Polytechnique, France; H.A. Stone, Harvard University, Cambridge, MA, USA*

Keynote: Cell-surface Adhesive Interactions in Microchannels and Microvessels *M. King, University of Rochester, Rochester, NY, USA*

Three Distinct Types of Morphological Responses of Cultured Vascular Endothelial Cells to Physiological Levels of Fluid Shear Stress *M. Masud, K. Fujiwara, University of Rochester, Rochester, NY, USA*

Examples Of Microchannel Mass Transfer Processes In Biological Systems *S.G. Kandlikar, M.E. Steinke, Rochester Institute of Technology, Rochester, NY, USA*

Pulsed Injector Induced Mixing in High Aspect Ratio Microchannel Flows *B. Siripoorikan, J.A. Liburdy, D.V. Pence, Oregon State University, Corvallis, OR, USA*

Dispensing Picoliter Droplets Using DEP Micro-actuation *R. Ahmed, D. Hsu, C. Bailey, T. B. Jones, University of Rochester, Rochester, NY, USA*

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/micromini

6:00pm–9:30pm **Conference Banquet** *Session Chair: G. P. Celata, ENEA - Institute of Thermal-Fluid Dynamics, Rome, Italy*

Banquet Speakers

Micro and Nanochannel Biomolecular Transport *A. Majumdar, University of California, Berkley, CA, USA*

Industrial Applications of Microchannels in Highly Efficient, Compact Heat Exchangers *S. Memory, Modine Manufacturing Company, Racine, WI, USA*

FRIDAY APRIL 25, 2003

XEROX AUDITORIUM, COLLEGE OF ENGINEERING, RIT

8:00am–10:00am **Session 2-A-1** *Session Chair: J. Pettersen, Norwegian University of Science and Technology (NTNU), Norway*

Keynote: Challenges in Electronic Cooling – Opportunities for Enhanced Thermal Management Techniques *R. Schmidt, IBM Corporation, Poughkeepsie, NY, USA*

Development of Interferometric Temperature Measurement Procedures For Microfluid Flow *D. Newport, J. Garvey, University of Limerick, Limerick, Ireland; M. Whelan, Institute for Health and Consumer Protection, Italy; T. Dalton, University of Limerick, Limerick, Ireland*

Scaling The Performance Of Micro-Fans *R. Grimes, E. Walsh, University of Limerick, Limerick, Ireland; S. Kunz, Institut für Mikrotechnik Mainz GmbH, Germany; M. Davies, University of Limerick, Limerick, Ireland*

Liquid Mixing In Static Micro Mixers With Various Cross Sections *N. Kockmann, M. Engler, C. Föll, P. Woias, University of Freiburg, Germany*

Comparison Of Heat Conduction And Radiation Of Nano-Size Gas Gaps *X.-G. Liang, M.-H. Han, Tsinghua University, China*

Flow Pattern Measurement by PIV in the Micro-channels of a Heat Exchanger and Associated Problems Due to Fouling *V. Heinzl, A. Jianu, H. Sauter, Institut für Reaktorsicherheit, Germany*

8:00am–10:00am **Session 2-A-2** *Session Chair: S. Y. Lee, Korea Advanced Institute of Science and Technology, Korea*

Keynote: Unique Characteristics of Adiabatic Gas-Liquid Flows in Microchannels: Diameter and Shape Effects on Flow Patterns, Void Fraction and Pressure Drop *M. Kawaji, P.M.-Y. Chung, University of Toronto, Toronto, Ontario, Canada*

Flow Stability of Falling and Shear-Driven Films in Micro- and Minigrooves *T. Gambaryan-Roisman, P. Stephan, Darmstadt University of Technology, Germany*

The Thermocapillary Convection in Locally Heated Laminar Liquid Film Flow Caused by a Co-Current Gas Flow in Narrow Channel *E.Y. Gatapova, Y.V. Lyulin, I.V. Marchuk, O. A. Kabov, Institute of Thermophysics, RAS, Russia; J.C. Legros, Université Libre de Bruxelles, Brussels, Belgium*

Two-phase Flow Pattern and Pressure Drop in a Microchannel *O.A. Kabov, Institute of Thermophysics, RAS, Russia; C.S. Iorio, P. Colinet, Université Libre de Bruxelles, Brussels, Belgium; J.C. Legros, Euro Heat Pipes, S.A., Nivelles, Belgium*

Mass Flowrate Distribution and Phase Separation of R-22 in Multi-Microchannel Tubes Under Adiabatic Condition *H. Cho, K. Cho, Sungkyunkwan University, Korea; Y.-S. Kim, Samsung Electronics, Korea*

Experimental Investigation Of The Effect Of Surface Tension And The Correlations On Void Fraction And Frictional Pressure Drop Of An Air-Liquid Two-Phase Flow In a Horizontal Flat Capillary Rectangular Channel *H. Ide, Kagoshima University, Japan, T. Fukano, Kyushu University, Japan*

8:00am–10:00am **Session 2-A-3** *Session Chair: P. Hrnjak, University of Illinois at Urbana Champaign, IL, USA*

Keynote: Single-Phase Laminar Flow Heat Transfer and Two-Phase Oscillating Flow Heat Transfer in Microchannels *S. Nishio, University of Tokyo, Japan*

Experiments About Simple Liquid Flows in Microtubes *Z. Li, H. Cui, Chinese Academic of Sciences, Beijing, China*

Maximum Heat Transfer Rate Density In Two-Dimensional Minichannels and Microchannels *M. Favre-Marinet, S. Le Person, Laboratoire des Ecoulements Géophysiques et Industriels, France; A. Bejan, Duke University, SC, USA*

Analytical And Numerical Modeling Of Micro Heat-Exchangers *G.E. Cossali, D. Di Pietro, M. Marengo, Università di Bergamo, Italy*

Design Analysis Of A 3-D, Ultra-High Performance, Scalable, Micro Convective Heat Sink with NPCM *Y.-X. Tao, R. Moreno, Y. Hao, Florida International University, FL, USA*

Three-Dimensional Thermal Analysis of Heat Sinks with Circular Cooling Microchannels *C.J. Kroeker, H.M. Soliman, S.J. Ormiston, University of Manitoba, Canada*

10:15am–12:15pm **Session 2-B-1** *Session Chair: V. Wadekar, Aspen Technology, United Kingdom*

Keynote: Critical Heat Flux in Microchannels – Experimental Issues and Guidelines for CHF Measurements *A.E. Bergles, MIT, Cambridge, MA, USA; S.G. Kandlikar, Rochester Institute of Technology, Rochester, NY, USA*

Flow Boiling And Pressure Drop In Parallel Flow Microchannels *M.E. Steinke, S.G. Kandlikar, Rochester Institute of Technology, Rochester, NY, USA*

Extending the Applicability of the Flow Boiling Correlation at Low Reynolds Number Flows in Microchannels *S. Kandlikar, P. Balasubramanian, Rochester Institute of Technology, Rochester, NY, USA*

Preliminary Consideration To Avoid Eruptive Flow Boiling In Microchannels *D.W. Jeong, K.U. Koh, S.Y. Lee, Korea Advanced Institute of Science and Technology, Korea*

An Extra Mode Of Enhanced Heat Transfer By Oscillating Bubbles In Mini- and Microchannels *J.J. Schröder, S. Alraun, Institute of Thermodynamics, Germany*

Heat Transfer And Pressure Drop For Flow Boiling Of Water In Narrow Vertical Rectangular Channels *J. Shuai, R. Kulenovic, M. Groll, University of Stuttgart, Germany*

10:15am–12:15pm **Session 2-B-2** *Session Chair: M. Kawaji, University of Toronto, Toronto, Ontario, Canada*

Interfacial Electrokinetics Effects on Fluid Flow in Microchannels by a Generalized Lattice Boltzmann Model *B. Li, S.J. Chai, F. Tian, D.Y. Kwok, University of Alberta, Canada*

Time-Dependent Electrokinetic Slip Flow in Infinitely Extended Rectangular Microchannels *J. Yang, University of Alberta, Canada; D.Y. Kwok, University of Alberta, Canada*

Behaviors of Micropolar Flows in a Rotating Annulus *Y.J. Kim, SungKyunKwan University, Korea*

Simulation of Flow and Mass Transport in a Meander Micro-channel Subject to Electroosmotic Driving *D.P.J. Barz, P. Ehrhard, Institut für Kern - und Energietechnik, Germany*

Modeling of Surface-Fluid Electrokinetic Coupling on the Laminar Flow Friction Factor In Microtubes *D. Brutin, L. Tadrist, Ecole Polytechnique Universitaire de Marseille, France*

The Electric Double Layer Effect On The Microchannel Flow Stability *S. Tardu, Laboratoire des Ecoulements Géophysiques et Industriels, France*

10:15am–12:15pm **Session 2-B-3** *Session Chair: W. Grande, Rochester Institute of Technology, Rochester, NY, USA*

Keynote: Heat Transfer and Fluid Flow in Inkjet Printers *S. Mulay, Lexmark Corp., USA*

Fluid Transport and Phase Transition Experiments in Closed Multiwall Carbon Nanotubes *A.G. Yazicioglu, University of Illinois at Chicago, IL, USA; C.M. Megaridis, University of Illinois at Chicago, IL, USA; Y. Gogotsi, Drexel University, Philadelphia, PA, USA*

Theoretical and Experimental Study of Microchannel Blockage Phenomena *E. Yamaguchi, R.J. Adrian, University of Illinois at Urbana Champaign, Urbana, IL, USA*

Laminate Mixing in Microscale Fractal-Like Merging Channel Networks *K.E. Enfield, S.J. Siekas, D.V. Pence, Oregon State University, Corvallis, OR, USA*

Fluid Flow through Microscale Fractal-Like Branching Channel Networks *A. Alharbi, PAET College of Technological Studies, Shuwaikh, Kuwait; D.V. Pence, Oregon State University, Corvallis, OR, USA; R. N. Cullion, Oregon State University, Corvallis, OR, USA*

1:15pm–3:15pm **Session 2-C-1** *Session Chair: P. Cheng, Hong Kong University of Science and Technology, Hong Kong*

Keynote: Single Phase Flow and Heat Transport and Pumping Considerations in Microchannel Heat Sinks *S.V. Garimella, V. Singhal, Purdue University, IN, USA*

Temperature Measurements And Surface Visualization In Microchannel Flows Using Infrared Thermography *V. Narayanan, Oregon State University, Oregon, USA*

A Comparison of Micro-PIV Experiments in a Mini-Channel to Numerical and Analytical Solutions *D. Newport, D. Curtin, M. Davies, University of Limerick, Limerick, Ireland*

Effect of Particle Sticking on the Micro-PIV Measurement in a Micro-Bypass Channel Flow *K.C. Kim, S.Y. Yoon, H.S. Ji, Pusan National University, Korea*

Micro-PIV Analysis of Flow Resistance Inside μ -Channels With Different Inlet Configuration *S.-J. Lee, G.-B. Kim, POSTECH, Korea*

Micro-PIV Investigation of a Sinusoidal Crossflow Microfiltration Module *M. Mielnik, L. Saetran, NTNU Norges Teknisk - Naturvitenskapelige Universitet, Norway*

1:15pm–3:15pm **Session 2-C-2** *Session Chair: Arun Majumdar, University of California, Berkeley, CA, USA*

Gaseous Slip Flow in a Micro-Channel *S.-S. Hsieh, H.-H. Tsai, C.-Y. Lin, C.-F. Huang, National Sun-Yat-Sen University, China*

Frictional Characteristics of Microchannel Gas Flow *A. Bari, J.-M. Koo, L. Jiang, J. Paidipati, K. Goodson, Stanford University, Palo Alto, CA, USA*

Heat Transfer Characteristics of Gaseous Flows in Micro-Channels *Y. Asako, H. Toriyama, Tokyo Metropolitan University, Japan*

Gaseous Flows In Rectangular Microchannels: Experimental Validation of a Second Order Slip Flow Model *S. Colin, P. LaLonde, R. Caen, Laboratoire de Genie Mecanique de Toulouse, France*

Flow Through Rough Microchannels: A Lubrication Perspective, France *S. Boedo, Rochester Institute of Technology, Rochester, NY, USA*

1:15pm–3:15pm **Session 2-C-3** *Session Chair: M. Jensen, Rensselaer Polytechnic University, Troy, NY, USA*

Keynote: Condensation Flow Mechanisms in Microchannels: Basis for Pressure Drop and Heat Transfer Models *S.V. Garimella, Iowa State University, Ames, Iowa, USA*

An Experimentally Validated Model for Two-Phase Sudden Contraction Pressure Drop in Microchannel Tube Headers *J. Coleman, Brazeway Inc, Adrian, MI, USA*

Effects of Liquid Properties on Pressure Drop of Two-Phase Gas-Liquid Flows through a Microchannel *A. Kawahara, Kumamoto University, Kumamoto, Japan; M. Sadatomi, Kumamoto University, Kumamoto, Japan; K. Okayama, Kumamoto University, Kumamoto, Japan; M. Kawaji, University of Toronto, Toronto, Ontario, Canada*

Measurement on Gas-liquid Interface in Microchannels using Laser Focus Displacement Meters *N. Fukamachi, T. Hazuku, T. Takamasa, T. Hibiki, Tokyo University of Mercantile Marine, Japan; M. Ishii, Purdue University, IN, USA*

Two Phase Flow Distribution In A Compact Heat Exchanger Header *J.S. Kim, Y. Bin Im, J.H. Park, K.T. Lee, Pukyong National University, Korea*

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/micromini

Analogy between Heat Transfer and Fluid Friction of Gas Liquid Two-Phase Flow in Minichannels *M. Kaji, Kinki University, Japan, T. Sawai, Kinki University, Japan, K. Mori, Osaka Electro-Communication University, Japan*

3:30pm–5:30pm **Session 2-D-1** *Session Chair: M. H. Kim, Pohang University of Science and Technology, Korea*

Study of Interface Roughness Influence on Thermal Resistance Across Double-layered Films by Molecular Dynamics Simulation *X.-G. Liang, L. Sun, Tsinghua University, China*

Experimental Investigation Of The Condensation Heat Transfer Coefficient Inside Multi-Port Microchannels *A. Cavallini, G. Censia, D. Del Col, L. Doretti, University of the Studies of Bergamo, Italy; G.A. Longo, Università di Padova, Vicenza, Italy; L. Rossetto, C. Zilio, Università di Padova, Padova, Italy*

Complete Convective Condensation Inside Small Diameter Horizontal Tubes *B. Mederic, M. Miscovic, V. Platel, P. Lavielle, Laboratoire d'Energétique, France*

Pressure Drop of Taylor Flow in Capillaries: Impact of Slug Length *M.T. Kreutzer, W. Wei, J.J. Heiswolf, F. Kapteijn, TU Delft – Lab. Chem. Tech., Netherlands*

Interface Motion Driven by Capillary Action in Microchannel *N. Ichikawa, R. Maeda, National Institute of Advanced Industrial Science and Technology (AIST), Japan*

NASA's Platform for Cross-Disciplinary Microchannel Research *S.Y. Son, NASA Glenn Research, Cleveland, OH, USA; S. Spearing, NASA Marshall Space Flight Center, Huntsville, AL, USA; J. Allen, NASA Glenn Research, Cleveland, OH, USA; L.A. Monaco, NASA Marshall Space Flight Center, Huntsville, AL, USA*

3:30pm–5:30pm **Session 2-D-2** *Session Chair: W.Q.Tao, Xi'an Jiaotong University, China*

Keynote: Distribution Issue In Parallel Flow Microchannel Heat Exchangers *P. Hrnjak, University of Illinois at Urbana Champaign, IL, USA*

Fluid Flow and Heat Transfer in Microchannels with Rectangular Cross Section *H.-Y. Kwak, J.-Y. Jung, Chung-Ang University, Korea*

A Study on Stirring Characteristics in a Microchannel with Various Arrangement of Blocks *Y.K. Suh, H.S. Heo, Dong-A University, Busan, Korea*

Single-Phase Fluid Flow and Heat Transfer of Water in Micropipes *A. Bucci, University of Rome, Italy; G.P. Celata, M. Cumo, E. Serra, G. Zummo, National Institute of Thermal Fluid Dynamics, Rome, Italy*

Pressure Losses In A Network Of Triangular Microchannels *M. Niklas, Univ. of Czestochowa, Poland, M. Favre-Marinet, Laboratoire des Ecoulements Géophysiques et Industriels, France*

Effects Of Axial Heat Conduction In The Wall On Convection In Microtubes *Z.-X. Li, W. Wang, Z.-Y. Guo, Tsinghua University, China*

3:30pm–5:30pm **Session 2-D-3** *Session Chair: M. King, University of Rochester, Rochester, NY, USA*

Keynote: Fabrication Technologies for Advanced Microchannel Heat Transfer Applications *W.J. Grande, Rochester Institute of Technology, Rochester, NY, USA*

A Study of the Fabrication And Analysis Of Micro Diffuser/Nozzle *K.-S. Yang, National Yulin University, Taiwan; I.-Y. Chen, National Yulin University, Taiwan; B.-Y. Shew, Synchrotron Radiation Research Center, Hsinchu, Taiwan; C.-C. Wang, Industrial Technology Research Institute, Hsinchu, Taiwan*

Direct Write Patterning Of Microchannels *C. Fries, Intelligent Micro Patterning, FL, USA; D. Fries, H. Broadbent, G. Steimle, E. Kaltenbacher, University of South Florida Center for Ocean Technology, FL, USA; J. Sasserath, Intelligent Micro Patterning, FL, USA*

Ink Jet Processing of Metallic Nanoparticle Suspensions for Electronic Circuitry Fabrication *J.B. Szczech, University of Illinois at Chicago, IL, USA; C.M. Megaridis, University of Illinois at Chicago, IL, USA; J. Zhang, Motorola Advanced Technology Center, Schaumburg, IL, USA; D. Gamota, Motorola Advanced Technology Center, Schaumburg, IL, USA*

Rapid Design, Fabrication And Optimization Of A Single Shot Thermo-Pneumatic Micro-Actuation For The Delivery Of Minute Amounts Of Liquids *A.M. Cardenas-Valencia, D.P. Fries, L.C. Langebrake, R.F. Benson, University of South Florida, Florida, USA*

6:00pm–9:30pm **Conference Closing Ceremony**
Directions for Future Microchannel and Minichannel Research – A Panel Discussion

G. P. Celata – Single Phase Liquid Flow in Microchannels
N. Constantinou – Single Phase Gas Flow in Microchannels
M. Kawaji – Adiabatic Two-Phase Flow in Microchannels and Minichannels
P. Hrnjak – Flow Boiling in Microchannels and Minichannels
S. Garimella – Flow Condensation in Microchannels and Minichannels

Closing Remarks

TOUR

Participants will view RIT's Micro Fuel Cells Lab, the Remanufacturing Lab, and the Clean Room Lab. Offered to the first 100 registered participants on Wednesday, April 23.

VENUE

The conference will be held at the **Radisson Hotel Airport** located at 175 Jefferson Road, Rochester, New York 14623. A limited number of sleeping rooms at a special reduced rate of \$75/night+tax will be available for conference attendees on a first come first serve basis. Reserve your room as soon as possible to obtain this special rate.

Reserve online at www.radisson.com or contact the hotel at (585) 475-1910, fax (585) 475-9633. Be sure to type ASME in the promotion code box when making a reservation online or tell them you have a promotion code of ASME if you make a reservation over the phone.

CONFERENCE RATES

\$425	Conference Rate
\$90	Spouse (access to opening reception and all banquets)

The 2nd Annual Nano Engineering & Investing Trends Conference

June 20, 2003 New York, New York

This one-day conference will be presented at the NYU Stern School of Business in conjunction with NYU's Berkley Center for Entrepreneurial Studies. The technical sessions will focus on health care, computing, information processing and information storage advances. The investing sessions will focus on angel, corporate, and venture capital investing in these areas.

PROGRAM

7:30am–8:30am	Registration
8:30am–8:45am	Welcome & Introduction <i>Arun Majumdar, University of California, Berkeley</i>
8:45am–9:15am	Nano-Engineering: Path to Discovery and Innovation <i>Stephen Y. Chou, Princeton University</i>
9:15am–9:40am	Nano Advances & Applications: Health Care <i>Arun Majumdar, University of California, Berkeley</i>
9:40am–10:00am	Nanometer Scale Science and Technology Update <i>Phaedon Avouris, IBM Research Division (Invited)</i>
10:00am–10:45am	Nano in New York - Panel Discussion <i>Stephen R. Wilson, NYU, Andy Kent, NYU, Philip Kim, Columbia University</i>
10:45am–11:00am	Break
11:00am–11:20am	Advances & Applications: Micro/Nano Fluidics <i>Boris Khusid, New Jersey Institute of Technology</i>
11:20am–11:40am	Nano Advances & Applications: Materials & Sensors <i>Robert Hull, University of Virginia</i>
11:40am–Noon	Nano Advances & Applications: Semiconductor Tools, <i>F. Michael Serry, Veeco Instruments</i>
Noon–1:30pm	Lunch
1:30pm–2:30pm	Nano Investing Trends Panel <i>Moderator: Josh Wolfe, Lux Capital</i> <i>Jason Friedman, JP Morgan Partners, LLC</i> <i>Douglas W. Jamison, Harris & Harris Group, Inc.</i> <i>Christian E. Stich, Toucan Capital Corp.</i>
2:30pm–3:30pm	Nanotechnology: Winning Technology for GE <i>Vanita Mani, GE Corporate Research & Development</i> RF MEMS Devices for Wireless Communications <i>David E. Seeger, IBM Research</i> Near Term Applications of Carbon Nanotubes: Transparent Conductors <i>Joseph Piche, Eikos, Inc.</i>

Dip Pen Nanolithography; Applications in Microelectronics & Life Sciences
Guy Della Cioppa, Nanolnk Inc.

Precise and Accurate Nanoscale Metrology
Tim Goldburt, NanoMetrology LLC

Quantum Cryptography *Bob Gelfond, MagiQ Technologies, Inc.*

Nano Tools *Mark LeClair, Nanospire Inc.*

3:30pm–4:30pm

Break/Lab Tour/Company Showcase

WHO SHOULD ATTEND

- Researchers
- Application Engineers
- Scientists
- Company Technology Leaders
- Venture Capitalists
- Professionals interested in the research, development and commercialization of nanotechnology
- Those interested in learning more about the field

TOUR

Participants will have the opportunity to view Professor Andy Kent's Mesoscopic Magnetism lab at New York University focusing on the physics of small scale ferromagnetic structures, typically with nanometer sizes or artificial material structure on the nanometer scale.

COMPANY SHOWCASE

Firms facilitating the development of advanced technologies are invited to share their discoveries at the conference. Exhibit space is available as table-tops in the company showcase location. Enhance your company's leadership position and raise brand awareness by sponsoring activities. For further information please email: nano@asme.org.

VENUE

New York University Leonard N. Stern School of Business
The Berkeley Center for Entrepreneurial Studies
44 West Fourth Street, New York, NY 10012
Tel: 212-998-0070

CONFERENCE RATES

\$75	Students
\$125	ASME Members, NYU Alumni, AIChE, IEEE, and other professional society members, academia, government
\$175	General Audience
<i>After June 1, 2003</i>	
\$100	Students
\$150	ASME Members, NYU Alumni, AIChE, IEEE, and other professional society members, academia, government
\$200	General Audience

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/nano/forum

Nano Training Bootcamp

July 8–11, 2003 Evanston, Illinois

The ASME Nano Training Bootcamp is specifically organized to offer a detailed and tutorial-based account of advances in fundamentals related to Nanoscience in a wide variety of fields, and prospects for translating these advances into useful Nanotechnologies. The participants will be challenged with open-ended questions and opportunities in engineering nanosystems. Given by world-renowned experts in academia and industry, the ASME Nano Bootcamp will be held at the leading Nanotechnology research environment of Northwestern University.

PROGRAM

TUESDAY, JULY 8, 2003

7:30am–8:00am	Registration
8:00am–8:10am	Welcome from ASME & Northwestern University <i>Arun Majumdar, Raj Manchanda, Vinayak David</i>
8:10am–8:45am	Plenary Lecture <i>Mark Ratner, Northwestern University</i>
8:45am–10:00am	Introduction to Quantum Mechanics <i>Venkat Chandrasekhar, Northwestern University</i>
10:00am–10:20am	Break
10:20am–11:35am	Introduction to Statistical Mechanics <i>Monica Olvera-de-la-Cruz, Northwestern University</i>
11:35pm–1:00pm	Lunch
1:00pm–2:15pm	Electronic and Optical Properties of Materials <i>Rajeev Ram, Massachusetts Institute of Technology</i>
2:15pm–3:30pm	Magnetic Properties of Materials <i>Vinayak David, Northwestern University</i>
3:30pm–3:50pm	Break
3:50pm–5:05pm	Mechanical Properties of Materials <i>Rod Ruoff, Northwestern University</i>
5:05 - 6:20pm	Thermal Properties of Materials <i>Li Shi, University of Texas, Austin</i>

WEDNESDAY, JULY 9, 2003

8:00am–9:15am	Electronic Devices <i>Mark Hersam, Northwestern University</i>
9:15am–10:30am	Optical Devices <i>Rajeev Ram, Massachusetts Institute of Technology</i>
10:30am–10:50am	Break
10:50am–12:05pm	Thermoelectric Devices <i>Ali Shakouri, University of California, Santa Cruz</i>
12:05pm–1:30pm	Lunch

1:30pm–2:45pm	Mechanical Devices <i>Jim Hone, Columbia University</i>
2:45pm–4:00pm	Properties of Liquids, Polymers, and Interfaces <i>Gregory S. Blackman, DuPont</i>
4:00pm–4:20pm	Break
4:20pm–6:00pm	Introduction to Molecular Biology <i>Ram H. Datar, University of Southern California</i>

THURSDAY, JULY 10, 2003

8:00am–9:15am	Principles of Self Assembly <i>Sam Stupp, Northwestern University</i>
9:15am–10:30am	Soft and Imprint Lithography <i>S.V. Sreenivasan, Molecular Imprints, Inc.</i>
10:30am–10:50am	Break
10:50am–12:05pm	Nanoparticles and Nanowires <i>Teri Odom, Northwestern University</i>
12:05pm–1:30pm	Lunch
1:30pm–2:45pm	Microfabrication and Integration <i>Liwei Lin, University of California, Berkeley</i>
2:45pm–4:00pm	Microfluidic/Bioanalytical Devices <i>Chang Liu, UIUC</i>
4:00pm–4:15pm	Break
4:15pm–6:00pm	Micro/Nanofabrication Lab Visit

FRIDAY, JULY 11, 2003

8:00am–9:15am	Scanning Probe Microscopy <i>Michael Serry, Veeco Metrology Group</i>
9:15am–10:30am	Electron Microscopy and Spectroscopy <i>Vinayak David, Northwestern University</i>
10:30am–10:45am	Break
10:45am–12:30pm	Microscopy Lab Visits

TOUR

The Nanoscale Science and Engineering Center brings together recognized leaders in nanotechnology from Northwestern University, University of Chicago, University of Illinois/Urbana-Champaign, and Argonne National Laboratory. Research focuses on (1) creating structures molecule by molecule (nanopatterning) (2) with surfaces that can sense and bind to chemical and biological agents (receptor sites) and (3) emit a measurable electrical or optical signal when binding occurs (signal transduction).

CONFERENCE RATES

\$595	Students
\$1595	ASME, AVS, IEEE, MRS, and APS members; Government, Academia
\$1995	Corporate

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/nano/bootcamp

Integrated Nanosystems 2003: Design, Synthesis and Applications

Sept. 17–19, 2003 Palo Alto, CA

This forum brings together a multidisciplinary group of scientists and engineers, representatives from the government and the venture community to discuss issues related to research, education, government and private funding, as well as commercialization.

Dear Colleague:

Welcome to Integrated Nanosystems 2003!

We at ASME-NI see a tremendous opportunity for novel technologies that can have far-reaching impact on our society. We realize, however, that a major challenge for the near future is the design, synthesis, and integration of nanostructures to develop functional nanosystems. In view of this, we organized our first Integrated Nanosystems conference in 2002. By all accounts it was a tremendous success. While we received extremely positive feedback from the participants, we were also told about some aspects where we needed improvement.

Constructive feedback is always invaluable and based on this, we have now organized Integrated Nanosystems 2003 in Palo Alto, California, in which the program has been revised in a way that will hopefully make it more enjoyable, fulfilling and a positive experience for you.

We also realized through the feedback that there is an urgent need for education in nanoscale science and engineering. The breadth and depth of topics needed for nanotechnology is difficult to cover in a single curriculum at an academic institution. In addition, there are many people who do not always have access to university courses. To address this, we organized the first NanoEducation Bootcamp this summer in Evanston, Illinois. The purpose of this four-day event was to provide an educational foothold for students, faculty, and practicing engineers/scientists in various interdisciplinary topics in nanoscale science and engineering. This was also very successful, and we hope to continue providing this educational forum in the future.

The ASME Nanotechnology Institute hopes to serve you in the development of nanotechnology. To do this effectively, your feedback and comments are critical. Please email: majumdar@me.berkeley.edu or go to our website: www.nanotechnologyinstitute.org

I look forward to meeting you in Palo Alto!

Sincerely,

Arun Majumdar
Maynard Professor of Mechanical Engineering
University of California

Chair, Nanotechnology Institute Advisory Board

PROGRAM

THURSDAY, SEPTEMBER 18, 2003

NANOTECHNOLOGY: A VISION

Richard L. Smalley, Rice University

NANOMATERIALS AND INTEGRATION

Synthesis of nanomaterials and how to integrate nanostructures into microsystems. This includes the integration of top-down lithographic approach with bottom-up directed self-assembly.

The Wet/Dry Interface in Nanotechnology

Vicki L. Colvin, Rice University

Nanoimprint: Enabling Nanomanufacturing Technology

Stephen Y. Chou, Princeton University

Exploiting Unique Properties of Nanoscale Materials for

Nanotechnology *Alex Zettl, University of California, Berkeley*

PANEL DISCUSSION: FUTURE TRENDS AND CHALLENGES FOR

NANOMATERIALS AND INTEGRATION *Vicki L. Colvin, Rice University;*

Stephen Y. Chou, Princeton University; Alex Zettl, University of

California, Berkeley

PLENARY ADDRESS: National and International Strategy for

Nanotechnology *Mihail Roco, NSTC's Nanoscale Science, Engineering*

and Technology Subcommittee, and National Science Foundation

INSTRUMENTS

Instruments that have spatial resolution in the nanometer range have revolutionized nanotechnology and are playing an integral role in its development. This session will focus on scanning probe microscopy, electron microscopy and related techniques.

The Physics of AFM Phase Imaging *Jason Cleveland, Asylum Research*

Teaching "Old" Materials "New" Tricks: Site-specific Nanopatterning

of Functional Inorganics *Vinayak Dravid, Northwestern University*

Applications of Single Molecule Spectroscopy and Imaging to

Macromolecules *Haw Yang, University of California, Berkeley*

THEORY AND COMPUTATIONS

Discussion of the latest developments in theoretical models and computational tools that are necessary for studying and rationally designing nanostructures and nanosystems.

Biomolecular Nanomechanics: Intercellular Communication and

Biosensors *Arup Chakraborty, University of California, Berkeley*

Multiscale Modeling for Nanosystem Design *K.J. Cho,*

Stanford University

Mechanics of Biological Nanotechnology: From Viruses to

Biofunctionalized Cantilevers *Rob Phillips, California Institute*

of Technology

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/nano

FRIDAY, SEPTEMBER 19, 2003

NANOTECHNOLOGY: A VISION

Evelyn Hu, University of California, Santa Barbara

BUSINESS & VENTURE PANELS

Discussion of issues related to commercialization and technology transfer of nanotechnology.

MEMS FOR NANOINTEGRATION AND NANOEXPLORATION

MEMS is a versatile platform for integrating nanostructures to design functional nanosystems. MEMS can also be used to design instruments to explore nanoscale phenomena. This session will emphasize this dual role of MEMS in nanotechnology.

Microdevice Platform for Nanoscale Science & Engineering

Arun Majumdar, University of California, Berkeley

The MEMS-Nano Connections: Accessing Nanotechnology through Microtechnology *Albert P. Pisano, University of California, Berkeley*

INFORMATION

Exploration of the latest developments in nanoscale devices and systems that process and store information, such as molecular electronics, magnetic, optical and mechanical recording etc.

A Systems Approach to Molecular Electronics *James R. Heath, California Institute of Technology*

Nanotechnology: A Data Storage perspective *Aric Menon, Technical University of Denmark*

Electronics With Single Molecules *Paul McEuen, Cornell University*

CHEMICAL AND BIOANALYTICAL SYSTEMS

Nanostructures and nanoscale phenomena can play an important role in detecting and analyzing molecules. This session will elaborate on the recent progress in sensors systems that have sufficient specific and sensitivity to make them technologically relevant.

Molecular Recognition Using Nanomechanical Sensors

Thomas G. Thundat, Oak Ridge National Lab

Nanoscopy BioPOEMS *Luke P. Lee, University of California, Berkeley*

ENERGY CONVERSION DEVICES & SYSTEMS

Nanostructures play important role in energy conversion systems such as thermoelectrics, photovoltaics, fuel cells etc. Discussion of the recent developments in energy conversion devices and systems based on nanoscale phenomena and structures.

Active Thermoelectrics: Semiconductor Devices with Internal Cooling

Rajeev Ram, MIT

Low-Dimensional and Nano-scale Thermoelectrics: Energy Conversion to Chemistry-on-a-Chip *Rama Venkatasubramanian, RTI*

Current Material Limitations and Material Development Needs for Automotive Fuel Cell Applications *Hubert Gasteiger, General Motors*

GOVERNMENT/EDUCATION/TRAINING PANEL

Discuss the role of the government in facilitating research in academia, national labs, and industry for development of nanotechnology

Session Chair : Meyya Meyyappan, NASA Ames Research Center

TOUR

Stanford University Lab Tour

September 17, 2003 at 3:00

COMPANY SHOWCASE/EXHIBIT

Firms facilitating the development of nanotechnology are invited to share their discoveries at the conference. Exhibit space is available as table-tops in the company showcase location. Enhance your company's leadership position and raise brand awareness by sponsoring activities. For further information on exhibiting and activity sponsorship please visit : www.asme.org/nano or email: nano@asme.org

VENUE

Crowne Plaza Cabaña Hotel

4290 El Camino Real

Palo Alto, CA 94306

United States

Tel: +1 650 628 0157 or in the US (1 888 422 2264 ext. 157)

Fax: +1 650 496 1939

Problems with hotel reservations? Email: pchand@cabanapaloalto.com

For more information about the hotel's visit:

www.cppaloalto.crowneplaza.com

TUTORIALS

Wednesday, September 17, 2003

PD 426: Mechanics of Carbon Nanotubes

12:30pm–3:30pm .3 CEUs

Vasyl Harik, NASA Langley Research Center

Carbon nanotubes possess extraordinary physical properties that can be used in new nanoscale devices and sensors, scanning probes and multifunctional materials. To realize these benefits, fundamental understanding of their material properties and mechanical behavior is required. This tutorial consists of an introduction about nanoscale science and an overview of applications, which are followed by units focused on various aspects of nanotube mechanics. Mechanics of graphite sheets, single-walled and multi-walled carbon nanotubes and nanotube-based materials will be discussed.

PD 427: Micro & Nanoscale Defects in Micro & Nanofabrication

8:30am–11:30am .3 CEUs

Ahmed Busnaina, Northeastern University

Tailored to meet the needs of the engineers, chemists, managers, consultants, and other professionals who are involved with nano and microfabrication, surface cleaning, preparation or engineering, particle removal, and contamination control responsibility in the MEMS, semiconductor, flat panel display, disk drive and other industries involved in microscale fabrication.

PD 444: Fundamentals & Simulations of Micro & Nano Flows

12:30pm–3:30pm .3 CEUs

Ali Beskok, Texas A&M University

Microfluidics is a rapidly developing technology with extensive applications in medical, pharmaceutical, defense and environmental monitoring applications. Examples are drug delivery, DNA analysis/sequencing systems and biological/chemical agent detection sensors on microchips. This tutorial provides an introduction to the principles and applications of micro- and nano-fluidic transport, and reviews several numerical modeling techniques appropriate for micro-and nano-fluidic simulation.

PD 479: Micro and Nanoscale Thermal Science and Engineering

8:30am–11:30am .3 CEUs

C. Channy Wong, Sandia National Laboratories

Recent developments in semiconductors, micro- and nano-systems have created an increased demand for understanding heat transport mechanisms in micro- and nano-domains. Based on experimental measurements, it is known that thermal conductivity of materials decreases with material thickness and temperature. As the size decreases, the dominant heat transport mechanism will be different as the characteristic length of the structure is compatible with the mean free path of the heat carriers, which will be phonons for dielectric materials or electrons for metals. This presentation covers the fundamental thermal science in nanoscale, examines research activities in experiments and material modelings, and addresses thermal transport issues in the micro- and nano-domains.

PD 478: Nanoscale Metrology Via Scanning Probe Microscopy

8:30am–11:30am .3 CEUs

Ionis Chasiotis, University of Virginia

The tutorial focuses on state-of-the-art applications of scanning probe microscopy (SPM) and its derivatives for precise and repeatable nanoscale metrology. It aims at assisting nanotechnology researchers in industry and academia to identify the potential application of this technology in their work. Some topics include calibration techniques, applications of special SPM methodologies, and metrology for semiconductor.

PD 480: Integrated Biomembrane Solid-state Nanodevices

12:30pm – 3:30 pm .3 CEUs

Jay T. Groves, University of California Berkeley

Life has unanimously adopted the phospholipid membrane as the molecular architecture of choice for coordination of nearly all biochemical processes. Composed of a self-assembling bilayer of phospholipid molecules, cholesterol, and other amphiphiles, biomembranes exhibit a collection of unusual properties not found in other materials. At the same time, membranes can be associated with solid substrates in a manner that preserves both their physical and biological attributes. This specialized interface, referred to as a supported membrane, forms the basis of integrated biomembrane nanodevices. The supported membrane technology holds out promise of capturing the functionality of live cell membranes while maintaining the simplicity and controllability of synthetic materials. This tutorial will review: i) the scientific background and physical characteristics of supported membranes; ii) recently developed micro- and nano-fabrication strategies for the production of integrated biomembrane devices; iii) emerging commercial and scientific applications of the new technology.

CONFERENCE RATES

	Early Bird	After August 31
Students	\$195	\$295
Poster Presenter	\$395	\$495
Member, Govt, Academia, NonProfit	\$495	\$595
Corporate	\$595	\$695
One-day	\$295	\$395

TUTORIAL RATES

AM Tutorials:	ASME Members	Others
PD 427 Micro & Nanoscale Defects in Micro & Nanofabrication	\$295	\$395
PD 425 Nanoscale Tribology & Mechanics of MEMS/NEMS	\$295	\$395
PD 479 Micro and Nanoscale Thermal Science and Engineering	\$295	\$395
PM Tutorials:	ASME Members	Others
PD 426 Mechanics of Carbon Nanotubes	\$295	\$395
PD 444 Fundamentals & Simulations of Micro & Nano Flows	\$295	\$395
PD 480 Integrated Biomembrane Solid-state Nanodevices	\$295	\$395

CALL FOR PAPERS FOR POSTER PRESENTATIONS

Abstracts for papers for poster presentations are now being accepted. Topics may include the conference topics: Nanomaterials and Integration; Instruments; Theory and Computations; MEMS for Nanointegration and Nanoexploration; Information; Chemical and Bioanalytical Systems; and Energy Conversion Devices & Systems. All abstracts will be reviewed by the session chairs. Final abstracts will be posted on the conference website and included in the conference program.

Abstract submissions are due June 16, 2003 and may be submitted online at: www.asme.org/nano

TO REGISTER

For complete program details, travel and hotel information and to register, go to: www.asme.org/nano

1st International Conference
Microchannels and Minichannels
April 24-25, 2003 Rochester, New York

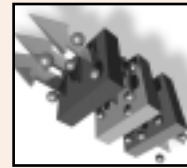
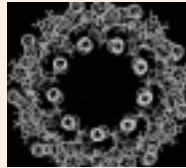
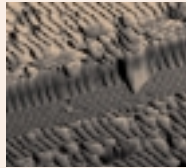
1st International Conference Fuel
Cell Science, Engineering and
Technology
April 21-23, 2003 Rochester, New York

Nano/Bio: Engineering Trends and
Applications Conference
April 3, 2003 Portland, Oregon

Integrated Nanosystems 2003
Design, Synthesis & Applications
September 17-19, 2003 Palo Alto, California

Nano Training Bootcamp
July 8-11, 2003 Northwestern University
Evanston, Illinois

Nano Engineering and Investing
Trends Conference
June 20, 2003 NYU Stern School of Business,
New York City



ASME Nanotechnology Institute Conferences



ASME International

The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990, U.S.A.

Non-Profit Org.
U. S. Postage
PAID
Permit No. 416
New York, NY

RESERVE YOUR SPACE TODAY!



**ASME
Nanotechnology
Institute**

C O N F E R E N C E S