

Preliminary Program

Transport Phenomena in Micro and Nanodevices

October 17-21, 2004
Kona, Hawaii

Conference Chair

Mohamed Gad-el-Hak
Caudill Eminent Professor and
Chair of Mechanical Engineering
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Conference Co-Chairs

Nobuhide Kasagi
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Sunday, October 17, 2004

6:00 – 7:00 pm Registration

7:00 – 8:00 pm Reception

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Monday, October 18, 2004

- 8:15 – 8:30 **Opening Remarks**
Mohamed Gad-el-Hak
- SESSION I: Quantum and Nano Transport**
Chair: Karen Jacobs
- 8:30 - 8:50 **Slippage of Liquids at the Nanoscale**
K. Jacobs, R. Konrad, H. Mantz, D. Podzimek
- 8:50 - 9:10 **Transport and Noise in Quantum Shuttles**
A. P. Jauho
- 9:10 - 9:30 **Theoretical Approach for Transport Properties of Molecular Electronics Based on Binuclear Phthalocyanine**
H. Mizuseki, H. Baba, R.V. Belosludov, A. A. Farajian, Y. Kawazoe
- 9:30 - 9:50 **Molecular Number Flux Detection Using Oxygen Sensitive Luminophore**
T. Niimi, H. Mori, M. Hirako, H. Uenishi
- 9:50 - 10:10 **Quantum and Discrete Impurity Effects in Nanoscale Devices**
D. Vasileska
- Coffee Break
- 10:30 - 10:50 **Ballistic Quantum Transport Simulations in Nano-Devices Using the Contact Block Reduction Method**
D. Mamaluy, M. Sabathil, D. Vasileska, P. Vogl
- 10:50 - 11:10 **Stochastic MD Simulations of Complex Fluids in Microdomains**
V. Symeonidis, B. Caswell, G. E. Karniadakis
- 11:10 - 11:30 **Simulation of ION Population Dynamics Dominated by Discrete Collisions Events in Rarified Gases in the Presence of Electromagnetic Fields**
A. Hieke
- 11:30 - 11:50 **Electrical Detection of Spin Resonance Signal from a Single Electron Trap**
I. Martin, D. Mozyrsky, H. W. Jiang
- 11:50 - 12:10 **Spin Transport in Quantum Wires**
S. Bandyopadhyay, M. Cahay, S. Pramanik
- Lunch Break

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SESSION II: Flow Manipulation/Actuation

Chair: Peter Ehrhard

- 1:30 - 1:50 **Electric Field-Driven Phenomena for Manipulating Particles in Micro- and Nano-Devices**
B. Khusid, A. Acrivos
- 1:50 - 2:10 **Generation of Nanofluidic Layers as a Means for Enhancing Mass Transport Coefficients in Protein-Surface Reactions**
H. P. Jennissen
- 2:10 - 2:30 **Analytical Results for Small-Scale, Shear-Driven Oscillatory Gaseous Flows**
N. Hadjiconstantinou
- 2:30 - 2:50 **Model and Validation of Electrokinetic Flow and Transport in a Micro Electrophoresis Device**
P. Ehrhard, D. P. J. Barz
- 2:50 - 3:10 **Lagrangian Chaos in a Microserpentine Mixer of Immuno-Magnetic Cell Sorting**
K. Fukagata, N. Kasagi, C. Chakranond
- Coffee Break
- 3:30 - 3:50 **Simulation, Fabrication, and Experimentation of Electrowetting Actuation in a Microchannel**
K. Mohseni, A. Dolatabadi
- 3:50 - 4:10 **Application of Micro Wall Jets for Enhanced Biosensor Fluid Mixing**
T. Mautner
- 4:10 - 4:30 **Fabrication and Transport of Metallic Nano Particles via Electrostatic Atomization**
K. A. Sallam, S. M. Bogadi, R. Sankarakrishnan
- 4:30 - 4:50 **The Study of Microscale Effects in an Experimental Setup with a Continuously Decreasing Characteristic Length**
H. Herwig, O. Hausner
- 4:50 - 5:10 **Electroosmotic Flow in Nanochannels: Fundamentals and Simulations**
R. Qiao, A. Chatterjee, S. Joseph, N. R. Aluru

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Tuesday, October 19, 2004

SESSION III: Modeling

Chair: Steffen Hardt

- 8:30–8:50 am **Recent Developments in Modeling Small-Scale Gaseous Hydrodynamics Beyond Navier-Stokes: The Transition and Free-Molecular-Flow Regimes**
N. Hadjiconstantinou
- 8:50–9:10 am **Liquids: The Holy Grail of Microfluidics Modeling**
M. Gad-el-Hak
- 9:10–9:30 am **The Constitutive Relations and Boundary Conditions for Gas Microflow Modeling**
D. Lockerby, J. Reese, D. Emerson, R. Barber
- 9:30–9:50 am **An Extended VOF Method for Microflow With Short-Range Interactions Between Fluid Interfaces**
S. Hardt
- 9:50–10:10 am **Recent Results of Rarefied Gas Dynamics and Their Applications in Microfluidics**
F. Sharipov
- Coffee Break
- 10:30–10:50 am **Rarefield Gas Flow and Its Relation to Damping in Inertial Microsensors**
F. Petri, C. Doering, R. Neul, R. Laur
- 10:50–11:10 am **Numerical Simulation of Flow in Micropump by Vorticity-Stream Function and Vorticity-Vector Potential Method**
H. Tokunaga, A. Fujiwara, M. Matsumoto
- 11:10–11:30 am **Flow of Gaseous Mixtures Through Rectangular Microchannels Driven by Pressure, Temperature and Concentration Gradients**
S. Naris, D. Valougeorgis, D. Kalempa, F. Sharipov
- 11:30–11:50 am **Design of Micro Synthetic Jet Actuator for Flow Control**
O. Baysal, M. Koklu, N. Erbas
- 11:50–12:10 pm **Heat Transfer in Thermal AFM Systems**
W. Ye, N. Masters, W. King
- Lunch Break

SESSION IV: Emerging Applications

Chair: Hiroshi Mizuseki

- 1:30–1:50 pm **The Fabrication of Nanofluidic Devices and the Study of Fluid Transport Through Them**
H. H. Bau

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1:50–2:10 pm	Comparison of Slip and Transitional Microchannel Flows Using Direct Simulation Monte Carlo J. Sung, J. Y. Yoo
2:10–2:30 pm	Confined Complex Fluid Dynamics S. Herminghaus
2:30–2:50 pm	Langmuir's Slip Model and EU's Generalized Hydrodynamics for Microfluidic Transport R. J. Myong
2:50–3:10 pm	Enhancement of Short-Strand DNA Renaturation by an Active Micromixer T. John, I. Mezic
	Coffee Break
3:30–3:50 pm	Coherent Nonlinear Chromatography E. B. Cummings
3:50–4:10 pm	Simplified Model of a Buoyancy-Driven Polymerase Chain Reaction (PCR) Device K. Ness, E. K. Wheeler, B. Bennett, J. Ortega, K. E. Goodson
4:10–4:30 pm	Wetting Morphologies on Topographically Structured Substrates: A Possible New Way to Open Microfluidics R. Seemann, K. Krishnacharya, S. Herminghaus
4:30–4:50 pm	Rheological Behavior and Spreading Properties of Silicone Oils on Glass in Various Geometries P. Woehl, A. Carre
4:50–5:10 pm	ION Transport Through Nanoslits Investigated by Impedance Spectroscopy R. Schoch, H. V. Lintel, P. Renaud
7:00 pm	Conference Banquet

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Wednesday, October 20, 2004

SESSION V: Experiments

Chair: Nobuhide Kasagi

- 8:30–8:50 am **Micro Visualization of Ferromagnetic Nanoparticles in Microcapillary Flow**
J. Matsushita, H. Kikura, M. Aritomi, Y. Kobayashi
- 8:50–9:10 am **Cavitation of Microparticles**
P. F. Dunn, M. Davis
- 9:10–9:30 am **High-Speed Micro-PIV Measurement of Micro Counter-Current Flow**
K. Shinohara, Y. Sugii, A. Aota, A. Hibara, T. Kitamori
- 9:30–9:50 am **Study on Heat Transfer Characteristics of Compact Heat Exchangers**
M. Mori, F. Kawashima, M. Fukagawa, K. Hasezaki
- 9:50–10:10 am **Experimental Study of Viscous Dissipation in Liquid Flow Through a Micro-Device**
H. El-Sadi
- Coffee Break
- 10:30–10:50 am **X-Ray Micro-PIV Measurements of Flows in Opaque Conduits**
S. J. Lee
- 10:50–11:10 am **Evaporation Dynamics of Liquid Sessile Micro Droplets on Solid Substrates of Different Wettability**
K. Graf, G. Li, J. Viertel, A. Fortig, R. Jordan
- 11:10–11:30 am **Characterization of Surface Roughness Effects on Pressure Drop in Single-Phase Flow in Mini/Micro Channels**
S. G. Kandikar, D. Schmitt, A. Carrano, J. Taylor
- 11:30–11:50 am **The Melting Temperature of Polymer Thin Films and Surfaces**
S. Herminghaus, R. Seemann, K. Landfester
- 11:50–12:10 pm **Negative Pressure and Electroviscous Effect in Nanochannels**
A. van den Berg, N. Tas

Lunch Break

SESSION VI: Two-Phase Flow/Mixing

Chair: Duncan Lockerby

- 1:30–1:50 pm **Visualization of Droplet Formation and Ejection from a Micromachined Ultrasonic Droplet Generator**
J. M. Meacham, E. L. Degertekin, A. G. Fedorov

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- 1:50–2:10 pm **Boiling Propagation Phenomena on a Solid Surface in Highly Superheated Liquid and Its Application to a Novel Micropump**
K. Okuyama, T. Kino, J. H. Kim, Y. Iida
- 2:10–2:30 pm **Dynamics of Microbubble Agents for Medical Ultrasound and Targeted Drug Delivery**
K. Sarkar, D. Chatterjee, P. Jain
- 2:30–2:50 pm **Mathematical Modelling of Mixing**
J. Gleeson
- 2:50–3:10 pm **An Engineering Model for the Evaporation of Solute Droplets on Polymer Substrates**
W. Wiechert, T. Haschke, C. Stupperich-Sequeira, K. -H. Graf
- Coffee Break
- 3:30–3:50 pm **Efficiency of Mixing in the Shear Superposition Micromixer**
F. Bottausci, C. Cardonne, C. Meinhart, I. Mezic
- 3:50–4:10 pm **Thermal-Hydraulics Characterization of a Microreactor**
C. Boyer, P. Font
- 4:10–4:30 pm **Optimal Binary Fluid Mixing in Heated Microchannels**
T. Mautner, J. Allen
- 4:30–4:50 pm **Prediction Model for Droplet Generation in a Microchannel Network**
M. M. Mielnik, G. J. Pedersen, L. R. Saetran
- 4:50–5:10 pm **An Experimental Investigation of Flow Boiling in a Microchannel**
C. Huh, M. H. Kim

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Thursday, October 21, 2004

SESSION VII: Wetting and Other Micro Phenomena

Chair: Stephan Herminghaus

- 8:30–8:50 am **Microdetonics: The Science and Engineering of Microscale Explosive Technology**
R. J. Adrian, D. S. Stewart
- 8:50–9:10 am **Three-Phase Line Patterns of Spreading Liquid on a Solid Surface**
N. Zhang, D. F. Chao, J. M. Sankovic
- 9:10–9:30 am **Spreading Behavior of an Impacting Drop on a Structured Rough Surface**
D. Sivakumar, K. Katagiri, T. Sato, H. Nishiyama
- 9:30–9:50 am **Paramagnetic Particles Self-Assembly Within Microgeometries**
D. Liu, M. Maxey, G. Karniadakis
- 9:50–10:10 am **Foamy Emulsions Confined in Channels: Digital Microfluidics**
R. Seemann, M. Ulmeanu, F. Wen, D. Melenevsy, S. Herminghaus
- Coffee Break
- 10:30–10:50 am **Passive Thermally Actuated Biochemical Reactions and Transport in Convective Flows**
V. Ugaz, N. Agrawal
- 10:50–11:10 am **Numerical Simulation on a Micropump Driven by Marangoni Effect Taking Interface Deformation into Account**
H. Yoshida, Y. Suzuki, M. Saito
- 11:10–11:30 am **Enhanced Microfluidic Mixing in Planar Asymmetric Curved Channel Geometries**
V. M. Ugaz, A. P. Sudarsan
- 11:30–11:50 am **Applications of MEMS Sensors in Thermal Engineering**
O. Nakabeppu
- 11:50–12:10 pm **Characteristic of Electrostatically Activated Resonant Fan Micromixer**
C. W. Tsao, K. Mohsnei
- 12:10–12:30 pm **Closing Remarks**
M. Gad-el-Hak, N. Kasagi, S. Hardt
- Lunch and Departure

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