

*Program*

***Second International Conference on  
Transport Phenomena in  
Micro and Nanodevices***

**11–15 June 2006**

**Il Ciocco Hotel and Conference Center, Barga, Italy**

**Conference Chair**

**Mohamed Gad-el-Hak**

Caudill Eminent Professor and  
Chair of Mechanical Engineering  
Virginia Commonwealth University, USA

**Conference Co-Chairs**

**Nobuhide Kasagi**

University of Tokyo, Japan

**Steffen Hardt**

Technische Universität Darmstadt, Germany

**Antti-Pekka Jauho**

Technical University of Denmark

**Tomohide Niimi**

Nagoya University, Japan

**ECI**

**Engineering Conferences International**

**6 MetroTech Center**

**Brooklyn, NY 11201**

**T: 1-718-260-3743; F: 1-718-260-3754  
info@eci.poly.edu; www.engconfintl.org**

**Sunday, June 11, 2006**

6:00–7:00 pm      **Registration**

7:00–7:30 pm      **Reception**

7:30–9:00 pm      **Dinner**

**Monday, June 12, 2006**

7:15–8:15 am            **Breakfast**

8:15–8:30 am            **Opening Remarks**  
M. Gad-el-Hak

**SESSION I: Single-Phase Flows I**

**Chair: Kendra Sharp**

8:30–8:50 am            **EXPLORING ROUGHNESS EFFECT ON LAMINAR INTERNAL FLOW—  
I-1                            ARE WE READY FOR A CHANGE? (Invited)**  
S. G. Kandlikar

8:50–9:10 am            **DEVELOPMENT OF PRESSURE SENSITIVE MOLECULAR FILM FOR  
I-2                            MICRO- AND NANO-FLOWS**  
Y. Matsuda, H. Mori, T. Niimi, H. Uenishi, M. Hirako

9:10–9:30 am            **NUMERICAL MODELING OF FLUID LAYERS IN HYDRODYNAMIC  
I-3                            FOCUSING**  
L. A. Solli, M. M. Mielnik, L. Furuberg, L. R. Sætran

9:30–9:50 am            **OCCURRENCE OF VORTICES IN ELECTROOSMOTIC MICRO- AND  
I-4                            NANOCANNEL FLOWS**  
G. Yossifon, I. Frankel, Touvia Miloh

9:50–10:10 am           **NUMERICAL SIMULATION OF ELECTROOSMOTIC FLOW IN  
I-5                            COMPLEX MICRO- AND NANOCANNELS**  
A. P. Markesteijn, G. O. F. Parikesit, Y. Garini, J. Westerweel

10:10–10:30 am         **Coffee Break**

**SESSION II: First principles modeling of charge and spin transport in nanostructures**

**Chair: Z. Ounaies**

10:30–10:50 am         **ELECTRONIC TRANSPORT IN NANODEVICES AT DIFFERENT  
II-1                            LENGTH SCALES—AN OVERVIEW (Invited)**  
A. P. Jauho

10:50–11:10 am         **FIRST-PRINCIPLES MODELLING OF ELECTRONIC TRANSPORT  
II-2                            ACROSS INTERFACES (Invited)**  
K. Stokbro

11:10–11:30 am         **THE RTM/NEGF METHOD FOR AB INITIO CALCULATIONS OF  
II-3                            ELECTRON TRANSPORT THROUGH NANOSTRUCTURES**  
K. Hirose

11:30–11:50 am  
**II-4**                    **SPIN TRANSPORT IN AC-DRIVEN DOUBLE QUANTUM DOTS  
(Invited)**

G. Platero, R. Sánchez, E. Cota, R. Aguado

11:50–12:10 am  
**II-5**                    **WHEN MEMS BECOME NEMS—TOWARDS QUANTUM  
NA NOELECTROMECHANICS (Invited)**

M. Jonson

12:10–1:30 pm            **Lunch**

1:30–3:30 pm            **Rest, Recreation and Informal Discussion**

**SESSION III: Mixing and Dispersion**

**Chair: R. K. Agarwal**

3:30–3:50 pm  
**III-1**                    **THE EFFECTS OF OUTLET BOUNDARY CONDITIONS ON  
SIMULATING SUPERSONIC MICROCHANNEL FLOWS USING  
DSMC**

M. Le, I. Hassan

3:50–4:10 pm  
**III-2**                    **CHARACTERISTICS OF FLOW PATTERN IN ALTERNATE PUMPING  
MICROREACTOR**

T. Fujiwara, H. Ohue, T. Ushijima, O. Kitoh

4:10–4:30 pm  
**III-3**                    **SIMULATION OF ELECTROKINETICALLY DRIVEN FLOW IN  
MICROCHANNELS MIXED BY PATTERNED HETEROGENEOUS  
SURFACE PATCHES AND BLOCKS**

D. Wang, J. Summers, P. H. Gaskell

4:30–4:50 pm  
**III-4**                    **ANALYTICAL MODEL OF DISPERSION IN MICROCHANNEL  
CREEPING FLOW**

M. Kaufman

4:50–5:10 pm  
**III-5**                    **IMBIBITION OF LIQUIDS IN POROUS MEDIA**

K. N. Odic, M. Dreyer

5:10–5:30 pm            **Coffee Break**

**SESSION IV: Two-Phase Flows I**

**Chair: A. J. H. Frijns**

5:30–5:50 pm  
**IV–1**

**FLUID PARTICLE APPROACHES TO MICRO AND NANOSCALE  
TRANSPORT PROBLEMS IN ENGINEERING AND APPLIED SCIENCES  
(Invited)**

M. Santer, M. Moseler

5:50–6:10 pm  
**IV–2**

**ANALYSIS OF FLOW PATTERNS EMERGING DURING EVAPORATION  
IN PARALLEL MICROCHANNELS (Invited)**

S. Hardt, B. Schilder, D. Tiemann, G. Kolb, V. Hessel, P. Stephan

6:10–6:30 pm  
**IV–3**

**WETTING PHENOMENA AND WATER RETENTION MODELING ON  
MICROSTRUCTURED, ALUMINUM SURFACES**

A. D. Sommers, A. M. Jacobi

6:30–6:50 pm  
**IV–4**

**ACTUATION METHODS FOR DIGITIZED HEAT TRANSFER**

E. S. Baird, K. Mohseni

6:50–7:10 pm  
**IV–5**

**PHASE-FIELD SIMULATIONS OF FREE BOUNDARY MICROFLOWS**

W. Villanueva, G. Amberg

7:30–9:00 pm

**Dinner**

9:00–10:00 pm

**Reception**

**Tuesday, June 13, 2006**

7:15–8:15 am            **Breakfast**

**SESSION V: Molecular Gas Flows I**

**Chair: A. P. Jauho**

8:30–8:50 am            **LATTICE BOLTZMANN SIMULATION OF SLIP FLOW IN  
V-1                            MICRODEVICES AT MODERATE KNUDSEN NUMBERS (Invited)**  
R. K. Agarwal

8:50–9:10 am            **ESTIMATION OF TMAC USING MAXWELLIAN TEMPERATURE  
V-2                            DISTRIBUTION IN COMBINATION WITH FLOW VELOCITIES**  
G. W. Finger, J. S. Kapat, W. J. MacDonald, III

9:10–9:30 am            **EXPERIMENTAL AND COMPUTATIONAL STUDIES OF TEMPERATURE  
V-3                            GRADIENT DRIVEN MOLECULAR TRANSPORT IN GAS FLOWS  
THROUGH NANO/ MICROSCALE CHANNELS**  
Y. L. Han, A. Alexeenko, M. Young, E. P. Muntz

9:30–9:50 am            **MODELING OF BACKWARD FACING STEP GAS FLOW IN  
V-4                            TRANSITION FLOW REGIME**  
U. Kursun, J. S. Kapat

9:50–10:10 am           **TRANSPORT PHENOMENA IN CARBON NANOTUBES  
V-5                            E. Campbell**

10:10–10:30 am         **Coffee Break**

**SESSION VI: Electronic Transport in Novel Material Systems**

**Chair: K. Stokbro**

10:30–10:50 pm         **NONLINEAR ELECTRONIC TRANSPORT IN SEMICONDUCTOR  
VI-1                            SUPERLATTICES (Invited)**  
L. Bonilla

10:50–11:10 pm         **DRIFT, DIFFUSION, AND NOISE IN HOPPING SYSTEMS (Invited)**  
VI-2                            M. Rossini, L. Reggiani

11:10–11:30 pm         **TUNNELING THROUGH NANOSYSTEMS: COMBINING BROADENING  
VI-3                            WITH MANY-PARTICLE STATES (Invited)**  
A. Wacker, J. N. Pedersen

11:30–11:50 pm         **DSMC SIMULATION OF SUBSONIC FLOWS IN PARALLEL AND  
VI-4                            SERIES MICROCHANNELS**  
M. Le, I. Hassan

11:50–12:10	<b>Discussion</b>
12:10–1:30 pm	<b>Lunch</b>
1:30–3:30 pm	<b>Rest, Recreation and Informal Discussion</b>

### **SESSION VII: Particulate Flows I**

**Chair: S. Hardt**

3:30–3:50 pm <b>VII–1</b>	<b>ELECTRIC FIELD DRIVEN TRANSPORT PHENOMENA AT THE MICROMETER AND NANOMETER SCALES (Invited)</b> B. Khusid, A. Acrivos, A. Kumar, T. S. Lo, J. Koplik
3:50–4:10 pm <b>VII–2</b>	<b>NUMERICAL SIMULATION OF DIELECTROPHORESIS IN BIOCHIPS</b> Y. Lin, G. Amberg, F. Aldaeus, J. Roeraade
4:10–4:30 pm <b>VII–3</b>	<b>CHARGE TRANSPORT MECHANISMS IN CARBON NANOTUBE-LIQUID POLYMER SYSTEMS UNDER ELECTRIC FIELD</b> Z. Ounaies, S. Banda
4:30–4:50 pm <b>VII–4</b>	<b>NUMERICAL AND EXPERIMENTAL STUDY OF NANOPARTICLE PRECIPITATION IN MICROREACTORS</b> N. Kockmann, J. Kastner, P. Woias
4:50–5:10 pm <b>VII–5</b>	<b>POLYMER DROPLETS ON SOFT, BRUSH-COATED SUBSTRATES</b> T. Kreer, K. Binder, C. Pastorino, M. Müller
5:10–5:30 pm	<b>Coffee Break</b>

### **SESSION VIII: Two-Phase Flows II**

**Chair: K. Mohseni**

5:30–5:50 pm <b>VIII–1</b>	<b>A HYBRID MD–DSMC MODEL FOR HEAT AND MASS TRANSFER IN MICRO- AND NANOCHANNELS</b> A. J. H. Frijns, S. V. Nedeia, E. A. T. van den Akker, A. A. van Steenhoven, A. J. Markvoort, P. A. J. Hilbers
5:50–6:10 pm <b>VIII–2</b>	<b>POLYMER MICROSTRUCTURES BY PHASE SEPARATION MICROMOLDING</b> R. G. H. Lammertink, M. Bikel, L. Vogelaar, M. Wessling
6:10–6:30 pm <b>VIII–3</b>	<b>SIMULATION OF COOLING THE WALLS OF NANOCHANNEL BY FLUID FLOWING INSIDE</b> Z. A. Walenta, A. Slowicka

6:30–6:50 pm  
**VIII–4**

**CREATING THIN LAYERS AT THE CONTACT SURFACE OF TWO  
NONMIXING LIQUIDS**

A. Slowicka, Z. Walenta

6:50–7:10 pm  
**VIII–5**

**EVAPORATION OF SOLVENT MICRODROPS ON POLYMER  
SUBSTRATES: CRATER GEOMETRIES AND PARAMETER  
SENSITIVITY ANALYSIS**

T. Haschke, K. Graf, E. Bonaccorso, G. Li, F.-T. Suttmeier, W. Wiechert

7:30–10:00 pm

**Conference Banquet**



Wednesday, June 14, 2006

7:15–8:15 am            **Breakfast**

**SESSION IX: Single-Phase Flows II**

**Chair: L. Bonilla**

8:30–8:50 am            **MASS AND CHARGE TRANSPORT IN MICRO AND NANO-FLUIDIC CHANNELS (Invited)**  
**IX-1**

N. A. Mortensen, L. H. Olesen, H. Bruus

8:50–9:10 am            **LATTICE BOLTZMANN BASED STRUCTURAL TOPOLOGY OPTIMIZATION OF MICRO CHANNELS**  
**IX-2**

M. Geier, Z. Lui, A. Greiner, J. Korvink

9:10–9:30 am            **IONIC AND BIOMOLECULAR TRANSPORT IN NANOCHANNELS**  
**IX-3**

A. T. Conlisk, A. Kumar and A. Rampsaud

9:30–9:50 am            **MASS TRANSPORT ACROSS AN ASYMMETRIC NANOCHANNEL DRIVEN BY OSCILLATING FORCES**  
**IX-4**

M. Chinappi, E. De Angelis, S. Melchionna, S. Succi, C. M. Casciola, R. Piva

9:50–10:10 am           **EFFECTS ON THE ELECTROOSMOTIC FLOW THROUGH NANOSCALE PORES IN PACKED BEDS**  
**IX-5**

B. Schaefer, H. Nirschl

10:10–10:30 am         **Coffee Break**

**SESSION X: Heat Transfer**

**Chair: A. T. Conlisk**

10:30–10:50 am         **COMPUTATIONAL STUDIES ON NANOSCALE HEAT TRANSFER**  
**X-1**

S. Vesa, P. Heino

10:50–11:10 am         **A HEAT TRANSPORT DEVICE BASED ON THERMOSENSITIVE MAGNETIC FLUID**  
**X-2**

K. Fumoto, M. Ikegawa, H. Yamagishi

11:10–11:30 am         **INVESTIGATION OF MICROOBJECTS HEAT TRANSFER**  
**X-3**

D. Zinoviev, V. Andreev, A. Kryukov, K. Tuzovsky, D. Loktev

11:30–11:50 am         **INFLUENCE OF MICROSTRUCTURES ON CONVECTIVE HEAT TRANSFER UNDER LAMINAR AND TURBULENT FLOW CONDITIONS**  
**X-4**

W. Augustin, K. Bode, N. Lucas, S. Buettgenback, S. Scholl

11:50–12:10 pm         **NA NO THERMAL SENSOR FOR SMART MICROFLUIDIC SYSTEMS**  
**X-5**

K. Takahashi

12:10–1:00 pm      **Lunch**

1:00–5:30 pm      **Optional Tour to Lucca**

5:30–5:50 pm      **Coffee Break**

**SESSION XI: Microfluidic Systems**

**Chair: N. A. Mortensen**

5:50–6:10 pm      **SELF-CONSISTENT TREATMENT OF QUANTUM TRANSPORT IN  
XI-1                    NANOSCALED FINFET DEVICES USING CBR METHOD**  
D. Mamaluy, H. Khan, D. Vasileska

6:10–6:30 pm      **DYNAMICAL SIMULATION OF FLOWS IN MICROPUMP ON SILICON  
XI-2                    WAFER**  
H. Tokunaga, M. Matsumoto

6:30–6:50 pm      **TOWARDS A QUANTITATIVE THEORY OF SINGLE MOLECULAR  
XI-3                    CONDUCTION**  
A. Ghosh, B. Muralidharan, S. Datta

6:50–7:10 pm      **DESIGN OF A LAB-ON-A-CHIP FOR CLINICAL TESTS OF HUMAN  
XI-4                    PHYSIOLOGICAL FLUIDS**  
J. M. Miranda, G. Minas, A. A. Vicente, J. A. Teixeira

7:30–9:00 pm      **Dinner**

9:00–10:00 pm     **Reception**

**Thursday, June 15, 2006**

7:15–8:15 am            **Breakfast**

**SESSION XII: Molecular Gas Flows II**

**Chair: A. Greiner**

8:30–8:50 am            **TRANSPORT OF REACTANTS IN A PLANAR MEMBRANELESS  
XII–1                      MICROCHANNEL FUEL CELL**

M. H. Chang, F. Chen, M. K. Lin, J. S. Tsai

8:50–9:10 am            **HOW FAR CAN 13 MOMENTS GO IN MODELLING    MICROSCALE GAS  
XII–2                      PHENOMENA?**

X. J. Gu, R. W. Barber, D. R. Emerson

9:10–9:30 am            **KINETIC APPROACH TO GAS FLOWS IN MICROCHANNELS  
XII–3**

S. Lorenzani, C. Cercignani, A. Frangi, A. Frezzotti, M. Lampis

9:30–9:50 am            **THEORETICAL MODELING OF GAS FLOW AND HEAT TRANSFER IN  
XII–4                      MICROCHANNELS**

R. S. Myong, T. H. Cho, J. H. Jung, Y. R. Yang

11:10–11:30 am         **BOUNDARY EFFECTS ON THE ELECTROPHORETIC MOTION OF  
XII–5                      CYLINDRICAL PARTICLES**

K. V. Sharp, S. M. Davison

10:10–10:30 am         **Coffee Break**

**SESSION XIII: Particulate Flows II**

**Chair: B. Khusid**

10:30–10:50 am         **PARTICLE ADVECTION IN A CHANNEL WITH TRAVELING WAVE  
XIII–1                      DIELECTROPHORESIS**

A. V. Straube, S. V. Shklyaev

10:50–11:10 am         **MOLECULAR DYNAMICS OF POLYMERS IN A MESOSCALE SOLVENT:  
XIII–2                      THE EFFECT OF SHEAR**

E. De Angelis, M. Chinappi, S. Melchionna, S. Succi, C. M. Casciola, R. Piva

11:10–11:30 am         **EFFECT OF GAS RAREFACTION IN THE GROOVED CHANNEL FLOW  
XIII–3                      IN MICRODEVICES**

S. Naris, D. Valougeorgis

11:30–12:10 pm         **Broad Panel Discussion and Closing Remarks**

M. Gad-el-Hak, S. Hardt, A. P. Jauho, T. Niimi

12:10–1:30 pm           **Lunch**

## POSTER SESSION

Monday–Thursday, June 12–15, 2006

8:00 am–6:00 pm

1. **EFFECT OF FRINGING FIELD ON PULL-IN VOLTAGE OF FIXED-FIXED END TYPE MEMS SWITCHES WITH VARIATIVE ELECTROSTATIC AREA**  
H Sadeghian, G. Rezazadeh
2. **RESEARCH OF VIBRATIONS INFLUENCE ON INTENSITY HEAT EXCHANGE OF MICRO-HEAT PIPES**  
V. Prisniakov, Yu Melikaev, V. Kravez, K. Prisniakov, Yu Nikolaenko
3. **NON-CONTACT MOVEMENT CONTROL OF FINE PARTICLES**  
S. Kuchii, Y. Minohara
4. **CHARACTERIZATION OF GAS FLOW THROUGH LONG MICROCHANNELS USING LOCAL PRESSURE MEASUREMENT**  
V. K. Lakshmi, K. B. Anoop, P. V. Harikrishna, S. K. Das
5. **A TUNABLE MICROLENS USING ELECTROWETTING ON SU-8**  
Y-J Chang, K. Mohseni, V. M. Bright
6. **THE STUDY OF HEAT TRANSFER IN SHORT LENGTH MICROCHANNELS**  
S. Vakiliipour, M. Darbandi
7. **APPRAISING NANOFLUID COOLED MICROCHANNEL HEAT SINK PERFORMANCE THROUGH THERMAL DISPERSION MODEL**  
H. Abbassi

**SUBMITTED ABSTRACTS NOT PRESENTED**

1. **THE EFFECT OF CHANNEL WALL ON BUBBLE DYNAMICS IN MICROCHANNELS**  
A. Keikhaee, S. Rouhani, Y. Saboohi
2. **NEW EXPERIMENTAL APPROACHES TO STUDY PERMEATION INDUCED FLOW IN PDMS BASED MICRO- AND NANOCHANNELS**  
E. Meyer, H. G. Braun
3. **MEASUREMENTS OF 3D FLOW FIELDS IN MICRO Y-JUNCTION FLOW VIA MICRO-DHPTV**  
S. Satake, H. Kanamori, T. Kunugi, K. Sato, T. Ito
4. **MORPHOLOGICAL CHANGES DUE TO CAPILLARY-DRIVEN FLOW AROUND AN ENTRAPPED GAS BUBBLE IN A LAB-ON-CHIP DEVICE**  
J. S. Allen, A. Herescu
5. **EFFECT OF NON-UNIFORM TEMPERATURE GRADIENT ON RAYLEIGH-BENARD-MARANGONI INSTABILITY IN A MICROPOLAR FERROMAGNETIC LIQUID**  
A. Abraham, G. Siddheshwar
6. **A STUDY ON COMBUSTION CHARACTERISTICS IN MICRO-COMBUSTOR FOR MICRO GAS TURBINE SYSTEM**  
J. Hua, M. Wu, X. C. Shan, Z. F. Wang
7. **BACKWARD PARTICLE TRACKING ALGORITHM FOR MICRO-MIXING QUANTIFICATION**  
A. Nahum, A. Seifert
8. **ASYMPTOTICS FOR REACTIONS IN MICROMIXERS**  
J. P. Gleeson
9. **SOLITON MECHANISM OF CHARGE TRANSPORT IN ONE-DIMENSIONAL MOLECULAR CHAINS AT THE PRESENCE OF ELECTROSTATIC FIELD**  
Y. Natanzon, L. Brizhik, A. Eremko
10. **MICROPATTERNING OF PROTEINS: A NEW APPROACH USING DEWETTING PRINCIPLES**  
C. Neto
11. **NUMERICAL MODELING OF PARTICLES FLOWING IN MICROCHANNELS**  
Y. F. Yap, D. Li, J. C. Chai
12. **SLIP FLOW AND HEAT TRANSFER IN RECTANGULAR MICROCHANNELS: SOLUTION VIA INTEGRAL TRANSFORMS**  
F. V. Castellões, R. M. Cotta
13. **THREE-DIMENSIONAL SIMULATION OF RANDOM PARTICLE PACKING AND TRANSPORT PROPERTIES PREDICTION FOR MICROSCALE PRODUCT OPTIMIZATION THROUGH VIRTUAL EXPERIMENTS**  
S. Ghosh

- 14. THERMAL CREEP ANALYTICAL MODELLING**  
G. Méolans, I. A. Graur, T. Ewart
- 15. GENERATING SPIN CURRENT BY AC MAGNETIC FIELD**  
J. Wang
- 16. ELECTRONIC TRANSPORT IN PILLARED NANOSTRUCTURES**  
E. A. Outkina, A. I. Vorobyova
- 17. ELECTRONIC PROPERTIES OF NANOSTRUCTURED VANADIA/POROUS ALUMINA FILM COMPOSITE**  
A. Khodin, H-I Hwang, S-M Hong, E. Outkina, A. Vorobyova
- 18. QUANTUM COHERENCE IN NANOMECHANICAL SYSTEMS**  
I. Martin, A. Shnirman, D. Mozyrsky, L. Tian, P. Zoller
- 19. GAS FLOW AROUND A LONGITUDINALLY OSCILLATING PLATE**  
D. Kalempa, F. Sharipov
- 20. PARTICLE INTERACTIONS IN DNA -LADEN FLOWS AT THE MICROSCALE**  
D. Trebotich, G. H. Miller, M. D. Bybee
- 21. BEEM MODELING FOR THE ELECTRON TRANSPORT INVESTIGATION IN SILICON QUANTUM DOTS**  
S. D. Hutagalung, K. A. Yaacob, R. Astrawinata, S. Sakrani