

# MEMS 2008 Tucson



21st IEEE International Conference on Micro Electro Mechanical Systems

**JANUARY 13 - 17, 2008**



## Advance PROGRAM

**CONFERENCE CO-CHAIRMEN**

Oliver Brand, Ph.D.  
*Georgia Institute of Technology*

&  
Yitshak Zohar, Ph.D.  
*University of Arizona*

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ROBOTICS AND AUTOMATION SOCIETY



## Sunday, January 13, 2008

4:00 p.m. -  
7:00 p.m. **REGISTRATION**

6:30 p.m. -  
8:30 p.m. **WELCOME RECEPTION**

## Monday, January 14, 2008

8:00 a.m. **WELCOME ADDRESS**

8:40 a.m. **INVITED SPEAKER**  
CMOS BASED SENSORS: FROM A SAMPLE TO REAL PRODUCTS  
Felix Mayer  
SENSIRION AG, SWITZERLAND

### SESSION I INTEGRATED MICROSYSTEMS

9:20 a.m. A 0.1DEG/HR BIAS DRIFT ELECTRONICALLY MATCHED TUNING FORK MICROGYROSCOPE  
A. Sharma, M.F. Zaman, M. Zurcher and F. Ayazi  
*Georgia Institute of Technology, USA*

9:40 a.m. FULLY MONOLITHIC CMOS NICKEL MICROMECHANICAL RESONATOR OSCILLATOR  
W.-L. Huang<sup>1</sup>, Z. Ren<sup>1</sup>, Y.-W. Lin<sup>1</sup>, H.-Y. Chen<sup>1</sup>, J. Lahann<sup>1</sup> and C.T. Nguyen<sup>2</sup>  
<sup>1</sup>University of Michigan, USA and <sup>2</sup>University of California, Berkeley, USA

10:00 a.m. **EXHIBITON INSPECTION AND BREAK**

### SESSION II MICROFLUIDIC DEVICES & SYSTEMS

10:30 a.m. MICROFLUIDIC ARRAY CHIP FOR SINGLE-CELL ISOLATION USING TWO-WAY PNEUMATIC ACTUATION  
Y.-J. Kim, J. Chung, H.-K. Lee and E. Yoon  
*University of Minnesota, USA*

10:50 a.m. MICROFLUIDIC FORMATION OF LIPID BILAYER ARRAY FOR MEMBRANE TRANSPORT ANALYSIS  
S. Ota, W. Tan, H. Suzuki and S. Takeuchi  
*The University of Tokyo, JAPAN*

11:10 a.m. A NEW DROPLET FORMATION CHIP UTILIZING CONTROLLABLE MOVING-WALL STRUCTURES FOR DOUBLE EMULSION APPLICATIONS  
C.H. Lee, Y.H. Lin and G.B. Lee  
*National Cheng Kung University, TAIWAN*

11:30 a.m. SURFACE ACOUSTIC WAVE INDUCED DYNAMIC PATTERNING OF MICRO BEADS IN MICROFLUIDIC CHANNELS  
J.J. Shi, D. Ahmed, X. Mao and T.J. Huang  
*Pennsylvania State University, USA*

11:50 a.m. QUANTITATIVE KINETIC ANALYSIS OF DNA NANOCOMPLEX SELF-ASSEMBLY WITH QUANTUM DOTS FRET IN A MICROFLUIDIC DEVICE  
Y.P. Ho<sup>1</sup>, H.H. Chen<sup>1</sup>, C.M. Puleo<sup>1</sup>, H.C. Yeh<sup>1</sup>, K.W. Leong<sup>2</sup> and T.H. Wang<sup>1</sup>  
<sup>1</sup>Johns Hopkins University, USA and <sup>2</sup>Duke University, USA

12:10 p.m. FULLY PASSIVE DEGASSING AND FUEL SUPPLY IN DIRECT METHANOL FUEL CELLS  
N. Paust, C. Litterst, T. Metz, R. Zengerle and P. Koltay  
*University of Freiburg, GERMANY*

12:30 p.m. **LUNCH**

1:30 p.m. -  
3:30 p.m. **POSTER/ORAL SESSION I**

3:30 p.m. **EXHIBITON INSPECTION AND BREAK**

**SESSION III MICROACTUATORS**

- 4:00 p.m. **A KNUDSEN PUMP USING NANOPOROUS ZEOLITE FOR ATMOSPHERIC PRESSURE OPERATION**  
N.K. Gupta and Y.B. Gianchandani  
*University of Michigan, Ann Arbor, USA*
- 4:20 p.m. **LIQUID MOTOR DRIVEN BY ELECTROWETTING**  
A. Takei, K. Nguyen, E. Iwase, K. Matsumoto and I. Shimoyama  
*The University of Tokyo, JAPAN*
- 4:40 p.m. **NOVEL ELECTRO-THERMAL BIMORPH ACTUATOR FOR LARGE OUT-OF-PLANE DISPLACEMENT AND FORCE**  
J. Wei, T. Chu Duc, G.K. Lau and P.M. Sarro  
*Delft University of Technology, THE NETHERLANDS*
- 5:00 p.m. **A FULLY FUNCTIONAL MICRO TRANSPORTATION SYSTEM WITH STRIDER-LIKE MOVEMENT OF MICRO CONTAINERS**  
D.V. Dao, P.H. Pham and S. Sugiyama  
*Ritsumeikan University, JAPAN*
- 5:20 p.m. **ADJOURN FOR THE DAY**

**Tuesday, January 15, 2008**

- 8:00 a.m. **INVITED SPEAKER**  
**CELL MANIPULATION IN MICROSYSTEMS FOR CLINICAL APPLICATIONS**  
Mehmet Toner  
*Massachusetts General Hospital, USA*

**SESSION IV BIOMEDICAL APPLICATIONS**

- 8:40 a.m. **IMPLANTABLE PARYLENE-BASED WIRELESS INTRAOCULAR PRESSURE SENSOR**  
P.-J. Chen<sup>1</sup>, D.C. Rodger<sup>2</sup>, S. Saati<sup>3</sup>, M.S. Humayun<sup>2</sup> and Y.-C. Tai<sup>1</sup>  
<sup>1</sup>California Institute of Technology, USA, <sup>2</sup>University of Southern California, USA and <sup>3</sup>Doheny Eye Institute, USA
- 9:00 a.m. **"MEMBRANE MICRO EMBOSS FOLLOWING EXCIMER LASER ABLATION (MEME-X) PROCESS" FOR PRESSURE-DRIVEN MICRO ACTIVE CATHETER**  
M. Ikeuchi and K. Ikuta  
*Nagoya University, JAPAN*
- 9:20 a.m. **MAGNETIC-BEAD-BASED MICROFLUIDIC SYSTEMS FOR DETECTION OF GENETIC DISEASES**  
K.Y. Lien, C.J. Liu and G.B. Lee  
*National Cheng Kung University, TAIWAN*
- 9:40 a.m. **A HYDROGEL-BASED WIRELESS SENSOR USING MICROMACHINED VARIABLE INDUCTORS WITH FOLDED FLEX-CIRCUIT STRUCTURES FOR BIOMEDICAL APPLICATIONS**  
V. Sridhar and K. Takahata  
*University of British Columbia, CANADA*
- 10:00 a.m. **EXHIBITON INSPECTION AND BREAK**

**SESSION V MICRORESONATORS**

- 10:30 a.m. **LIMITS OF QUALITY FACTOR IN BULK-MODE MICROMECHANICAL RESONATORS**  
S.A. Chandorkar<sup>1</sup>, M. Agarwal<sup>1</sup>, R. Melamud<sup>1</sup>, R.N. Candler<sup>2</sup>, K.E. Goodson<sup>1</sup> and T.W. Kenny<sup>1</sup>  
<sup>1</sup>Stanford University, USA and <sup>2</sup>Robert Bosch Corporation, USA
- 10:50 a.m. **TEMPERATURE MEASUREMENT AND COMPENSATION BASED ON TWO VIBRATING MODES OF A BULK ACOUSTIC MODE MICRORESONATOR**  
M. Koskenvuori<sup>1</sup>, V. Kaajakari<sup>2</sup>, T. Mattila<sup>2</sup> and I. Tittonen<sup>1</sup>  
<sup>1</sup>Helsinki University of Technology, FINLAND and <sup>2</sup>VTT Technical Research Center of Finland, FINLAND
- 11:10 a.m. **FROM VHF TO UHF CMOS-MEMS MONOLITHICALLY INTEGRATED RESONATORS**  
J. Teva, G. Abadal, A. Uranga, J. Verd, F. Torres, J.L.L. López, J. Esteve, F. Pérez-Murano and N. Barniol  
*Universitat Autònoma de Barcelona, SPAIN*

**SESSION VI PHYSICAL SENSORS & SYSTEMS**

- 11:30 a.m. **FOUR-DEGREE-OF-FREEDOM SOLID STATE MEMS JOYSTICK**  
P. Gieschke<sup>1</sup>, J. Richter<sup>2</sup>, J. Joos<sup>1</sup>, P. Ruther<sup>1</sup> and O. Paul<sup>1</sup>  
<sup>1</sup>University of Freiburg, GERMANY and <sup>2</sup>Technical University of Denmark, DENMARK
- 11:50 a.m. **A NOVEL DOUBLE-SIDE CMOS-MEMS POST PROCESSING FOR MONOLITHIC SENSOR INTEGRATION**  
C.M. Sun<sup>1</sup>, C. Wang<sup>1</sup>, M.H. Tsai<sup>1</sup>, H.S. Hsieh<sup>2</sup> and W. Fang<sup>1</sup>  
<sup>1</sup>National Tsing Hua University, TAIWAN and <sup>2</sup>Delta Electronics Inc, TAIWAN
- 12:10 p.m. **PROOFMASS-LESS VIBRATION SENSOR USING THE MOTION OF SELF-CHARGED ANION AND CATION IN AN ELECTROLYTE FOR ULTRA-HIGH FREQUENCY DETECTION**  
K.-H. Kim and Y.H. Seo  
Kangwon National University, KOREA
- 12:30 p.m. **LUNCH**
- 1:30 p.m. -  
3:30 p.m. **POSTER/ORAL SESSION II**
- 3:30 p.m. **ADJOURN FOR THE DAY**

**Wednesday, January 16, 2008**

- 8:00 a.m. **INVITED SPEAKER**  
**FIBER OPTIC NERVE SYSTEMS FOR MATERIALS AND STRUCTURES THAT CAN FEEL PAIN**  
Kazuo Hotate  
University of Tokyo, JAPAN

**SESSION VII PACKAGING & ASSEMBLY**

- 8:40 a.m. **IDENTIFICATION AND MANAGEMENT OF DIFFUSION PATHWAYS IN POLYSILICON ENCAPSULATION FOR MEMS DEVICES**  
B. Kim<sup>1</sup>, R.N. Candler<sup>2</sup>, R. Melamud<sup>1</sup>, S. Yoneoka<sup>1</sup>, H.K. Lee<sup>1</sup>, G. Yama<sup>2</sup> and T.W. Kenny<sup>1</sup>  
<sup>1</sup>Stanford University, USA and <sup>2</sup>Palo Alto Robert Bosch Research and Technology Center, USA
- 9:00 a.m. **IMPLANTABLE RF-COILED CHIP PACKAGING**  
W. Li, D.C. Rodger and Y.C. Tai  
California Institute of Technology, USA
- 9:20 a.m. **A MICROFLUIDIC-ELECTRIC PACKAGE FOR POWER MEMS GENERATORS**  
F. Herrault, C.-H. Ji, S.-H. Kim, X. Wu and M.G. Allen  
Georgia Institute of Technology, USA
- 9:40 a.m. **HIDDEN VERTICAL COMB-DRIVE ACTUATOR ON PDMS FABRICATED BY PARTS-TRANSFER**  
E. Iwase, H. Onoe, K. Matsumoto and I. Shimoyama  
The University of Tokyo, JAPAN
- 10:00 a.m. **EXHIBITON INSPECTION AND BREAK**

**SESSION VIII OPTICAL MEMS**

- 10:30 a.m. **ADAPTIVE FLUIDIC PDMS-LENS WITH INTEGRATED PIEZOELECTRIC ACTUATOR**  
F. Schneider<sup>1</sup>, D. Eberhard<sup>2</sup>, D. Strohmeier<sup>2</sup>, C. Müller<sup>1</sup> and U. Wallrabe<sup>1</sup>  
<sup>1</sup>University of Freiburg, GERMANY and <sup>2</sup>Fraunhofer Institute for Physical Measurement Technics, GERMANY
- 10:50 a.m. **NOVEL CONCAVE-BASED MICRO OPTICAL COMPONENTS**  
S.-Y. Hsiao, C.-C. Lee and W. Fang  
National Tsing Hua University, TAIWAN
- 11:10 a.m. **SINGLE MONOLAYER NANOCRYSTAL LED ON SCANNING OPTICAL MICROPROBE FOR MOLECULAR-RESOLUTION IMAGING AND PATTERNING**  
K. Hoshino, A. Gopal, D. Ostrowski, L. Rozanski, R. Patel, A. Heitsch, B. Korgel, D. VandenBout and X.J. Zhang  
The University of Texas at Austin, USA
- 11:30 a.m. **A NEW METHOD OF DRIVING AN AMOLED WITH MEMS SWITCHES**  
J.O. Lee, H.-H. Yang, W.W. Jang and J.-B. Yoon  
Korea Advanced Institute of Science and Technology, KOREA
- 11:50 a.m. **MEMS GRATINGS FOR NONDISPERSIVE OPTICAL PHASE MODULATION**  
G. Zhou, Y. Du and F.S. Chau  
National University of Singapore, SINGAPORE



12:10 p.m. **MECHANICALLY FLEXIBLE AND EXPANDABLE DISPLAY WITH CONDUCTIVE POLYMER COATED NYLON FABRIC**  
S. Takamatsu, K. Matsumoto and I. Shimoyama  
The University of Tokyo, JAPAN

12:30 p.m. **LUNCH**

1:30 p.m. -  
3:30 p.m. **POSTER/ORAL SESSION III**

3:30 p.m. **EXHIBITON INSPECTION AND BREAK**

**SESSION IX NEMS**

4:00 p.m. **BIOMOLECULAR MOTOR-BASED CARGO TRANSPORTERS WITH LOADING/UNLOADING MECHANISMS ON A MICRO-PATTERNED DNA ARRAY**  
S. Hiyama<sup>1,2</sup>, S. Takeuchi<sup>2</sup>, R. Gojo<sup>2</sup>, T. Shima<sup>2</sup> and K. Sutoh<sup>2</sup>  
<sup>1</sup>NTT DoCoMo, Inc., JAPAN and <sup>2</sup>The University of Tokyo, JAPAN

4:20 p.m. **DUAL-CHIRALITY HELICAL NANOBELTS: A NOVEL LINEAR-TO-ROTARY MOTION CONVERTER**  
L.X. Dong, L. Zhang, B.E. Kratochvil, K.Y. Shou and B.J. Nelson  
ETH Zurich, SWITZERLAND

4:40 p.m. **A MEMS READ-WRITE HEAD FOR FE PROBE STORAGE**  
Y. Zhao, E. Johns and M. Forrest  
Seagate Technology Inc., USA

5:00 p.m. **LOW POWER, WIDE DYNAMIC RANGE CARBON NANOTUBE VACUUM GAUGES**  
A. Kaul and H. Manohara  
Jet Propulsion Labs, USA

5:20 p.m. **ADJOURN FOR THE DAY**

6:00 p.m. -  
10:00 p.m. **CONFERENCE BANQUET**

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## Thursday, January 17, 2008

8:00 a.m. -  
10:00 a.m. **POSTER/ORAL SESSION IV**

10:00 a.m. - **EXHIBITON INSPECTION AND BREAK**

**SESSION X IMPLANTABLE MICRODEVICES**

10:30 a.m. **MEMS BASED BIO-ELECTRONIC NEURO-MUSCLE INTERFACES FOR INSECT FLIGHT CONTROL**  
A. Bozkurt<sup>1</sup>, R. Gilmour<sup>1</sup>, D. Stern<sup>2</sup> and A. Lal<sup>1</sup>  
<sup>1</sup>Cornell University, USA and <sup>2</sup>Boyce Thompson Institute, USA

10:50 a.m. **A CYBORG BEETLE: INSECT FLIGHT CONTROL THROUGH AN IMPLANTABLE, TETHERLESS MICROSYSTEM**  
H. Sato, C.W. Berry, B.E. Casey, G. Lavella, Y. Yao, and M.M. Maharbiz  
University of Michigan, USA

**SESSION XI RF MEMS**

11:10 a.m. **IDENTIFYING DEGRADATION MECHANISMS IN RF MEMS CAPACITIVE SWITCHES**  
R.W. Herfst<sup>1</sup>, P.G. Steeneken<sup>1</sup> and J. Schmitz<sup>2</sup>  
<sup>1</sup>NXP Semiconductors, THE NETHERLANDS and <sup>2</sup>University of Twente, THE NETHERLANDS

11:30 a.m. **INFLUENCE OF THE SUBSTRATE ON THE LIFETIME OF CAPACITIVE RF MEMS SWITCHES**  
P. Czarnecki<sup>1,2</sup>, X. Rottenberg<sup>1,2</sup>, P. Soussan<sup>1</sup>, P. Ekkels<sup>1,2</sup>, P. Muller<sup>1</sup>, P. Nolmans<sup>1</sup>, W. De Raedt<sup>1</sup>,  
H.A.C. Tilmans<sup>1</sup>, R. Puers<sup>2</sup>, L. Marchand<sup>3</sup> and I. De Wolf<sup>1,2</sup>  
<sup>1</sup>IMEC, BELGIUM, <sup>2</sup>Katholieke Universiteit Leuven, BELGIUM and <sup>3</sup>ESA/ESTEC, THE NETHERLANDS

11:50 a.m. **A LOW-LOSS 1.8GHZ MONOLITHIC THIN-FILM PIEZOELECTRIC-ON-SUBSTRATE FILTER**  
W. Pan, R. Abdolvand and F. Ayazi  
Georgia Institute of Technology, USA

12:10 p.m. **HIGH-Q, TUNABLE-GAP MEMS VARIABLE CAPACITOR ACTUATED WITH AN ELECTRICALLY FLOATING PLATE**  
H.S. Lee, Y.J. Yoon, D.-H. Choi and J.-B. Yoon  
Korea Advanced Institute of Science and Technology, KOREA

12:30 p.m. **CONFERENCE ADJOURNS**



## POSTER/ORAL PRESENTATIONS

<b>MP</b>	Monday	1:30 pm. - 3:30 p.m.	<b>TP</b>	Tuesday	1:30 pm. - 3:30 p.m.
<b>WP</b>	Wednesday	1:30 pm. - 3:30 p.m.	<b>ThP</b>	Thursday	8:00 a.m. - 10:00 a.m.

### BIO & CHEMICAL SENSORS

- MP**            **MAGNETIC BEAD RETENTION DEVICE FOR FULL ON-CHIP SANDWICH IMMUNO-ASSAY**  
F. Lacharme, C. Vandevyver and M.A.M. Gijs  
*Ecole Polytechnique Fédérale de Lausanne, SWITZERLAND*
- MP**            **SINGLE MOLECULE DETECTION IN TRULY, NANOLITER-SIZED VOLUMES: COUPLING EVAPORATION-BASED, MICROFLUIDIC CONCENTRATION WITH CONFOCAL FLUORESCENCE SPECTROSCOPY**  
C.M. Puleo, H.C. Yeh, K. Liu, T. Rane and T.H. Wang  
*Johns Hopkins University, USA*
- MP**            **UV ENHANCED OXYGEN SENSING OF ZNO NANOWIRES**  
L. Luo, B. Sosnowchik and L. Lin  
*University of California at Berkeley, USA*
- MP**            **ENHANCED TOXIC GAS DETECTION USING A MEMS PRECONCENTRATOR COATED WITH THE METAL ORGANIC FRAMEWORK ABSORBER**  
J. Yeom, I. Oh, Z. Ni, C. Field, A. Radadia, B. Bae, J.-H. Han, R.I. Masel and M.A. Shannon  
*University of Illinois, USA*
- MP**            **FLEXIBLE AND DISPOSABLE IMMUNOSENSORS BASED ON LAYER-BY-LAYER SELF ASSEMBLY OF CARBON NANOTUBES AND BIOMOLECULES**  
M. Lu, D. Lee, W. Xue and T. Cui  
*University of Minnesota, USA*
- TP**            **AN SU-8 BASED FLUIDIC IMMUNO-SPECTROSCOPIC LAB-ON-A-CHIP FOR RAPID QUANTITATIVE DETECTION OF BIOMOLECULES**  
L. Jiang, K.P. Gerhardt, B. Myer, Y. Zohar and S. Pau  
*The University of Arizona, USA*
- TP**            **GAS AND LIQUID PHASE SENSING OF VOLATILE ORGANICS WITH DISK MICRORESONATOR**  
S. Truax<sup>1</sup>, K.S. Demirci<sup>1</sup>, J.H. Seo<sup>1</sup>, P. Kurzawski<sup>2</sup>, Y. Luzinova<sup>1</sup>, A. Hierlemann<sup>2</sup>, B. Mizaiakoff<sup>1</sup> and O. Brand<sup>1</sup>  
<sup>1</sup>Georgia Institute of Technology, USA and <sup>2</sup>ETH Zurich, SWITZERLAND
- TP**            **FINGER-TOP TOTAL PROTEIN ANALYSIS SYSTEM BASED ON NEW BIOCHEMICAL IC CHIPS**  
K. Ikuta, N. Satake, T. Ohashi and M. Shibata  
*Nagoya University, JAPAN*
- WP**            **DETECTION OF C-REACTIVE PROTEIN BASED ON MEASUREMENT OF BROWNIAN MOTION BY MICRO PARTICLE TRACKING VELOCIMETRY**  
C.P. Liu, Y.J. Fan, C.J. Hsu, T.H. Wu and H.J. Sheen  
*National Taiwan University, TAIWAN*
- WP**            **EXPLOSIVE TRACE DETECTION WITH FBAR-BASED SENSOR**  
A. Lin, H. Yu, M. Waters, E.S. Kim and S.D. Goodman  
*University of Southern California, USA*
- WP**            **FUNCTIONALIZED HYDROGEL SURFACE PATTERNED IN A CHIP FOR LOCAL PH SENSING**  
H. Maruyama<sup>1</sup>, H. Matsumoto<sup>2</sup>, T. Fukuda<sup>1</sup> and F. Arai<sup>2</sup>  
<sup>1</sup>Nagoya University, JAPAN and <sup>2</sup>Tohoku University, JAPAN
- ThP**           **AN INTEGRATED MICROFLUIDIC SYSTEM FOR AFFINITY EXTRACTION AND CONCENTRATION OF BIOMOLECULES COUPLED TO MALDI-MS**  
T.H.T. Nguyen, R. Pei, C. Mei, J. Ju, M. Stojanovic and Q. Lin  
*Columbia University, USA*
- ThP**           **BIOMOLECULAR DETECTION USING NANOSCALE OPTOFLUIDIC SENSOR ARRAYS**  
S. Mandal, J. Goddard and D. Erickson  
*Cornell University, USA*
- ThP**           **EVALUATION OF CHEMICAL REACTION KINETICS USING A THERMALLY ACTIVE PIEZORESISTIVE MICROCANTILEVER ARRAY**  
A. Choudhury<sup>1</sup>, R. Vujanic<sup>2</sup>, P.J. Hesketh<sup>1</sup>, T. Thundat<sup>3</sup> and Z. Hu<sup>3</sup>  
<sup>1</sup>Georgia Institute of Technology, USA, <sup>2</sup>ETH Zurich, SWITZERLAND and <sup>3</sup>Oak Ridge National Laboratory, USA

### BIOMEDICAL SYSTEMS

- MP**            **A SELF-ADAPTIVE FLUIDIC PROBE FOR ELECTRICAL CAVITIES DETECTION**  
S.-H. Chang and Y.-C. Su  
*National Tsing Hua University, TAIWAN*
- TP**            **DUAL DRUG DELIVERY DEVICE FOR CHRONIC PAIN MANAGEMENT USING MICROMACHINED ELASTIC METAL STRUCTURES AND SILICON MICROVALVES**  
A.T. Evans, J.M. Park, S. Chiravuri and Y.B. Gianchandani  
*University of Michigan, USA*



- WP NOVEL PARYLENE CABLED SILICON PROBE SYSTEM FOR NEURAL PROSTHETICS  
R. Huang, C. Pang, Y.C. Tai, J. Emken, C. Ustun, R.A. Andersen and J.W. Burdick  
*California Institute of Technology, USA*
- WP AN IMPLANTABLE WIRELESS MICRODOSIMETER FOR RADIATION ONCOLOGY  
C. Son and B. Ziaie  
*Purdue University, USA*
- ThP FABRICATION AND TESTING OF A NOVEL ALL-DIAMOND NEURAL PROBE FOR CHEMICAL DETECTION AND ELECTRICAL SENSING APPLICATIONS  
H.Y. Chan<sup>1</sup>, D.M. Aslam<sup>1</sup>, S.H. Wang<sup>1</sup>, G.M. Swain<sup>1</sup> and K.D. Wise<sup>2</sup>  
<sup>1</sup>*Michigan State University, USA* and <sup>2</sup>*University of Michigan, USA*

## CELLULAR MANIPULATION

- MP INJECTION AND CUTTING METHODS OF ANIMAL CELLS USING A MICROFLUIDIC CHIP  
A. Ichikawa<sup>1</sup>, S. Takahashi<sup>2</sup>, K. Matsukawa<sup>2</sup>, T. Tanikawa<sup>1</sup> and K. Ohba<sup>1</sup>  
<sup>1</sup>*National Institute of Advanced Industrial Science and Technology, JAPAN* and <sup>2</sup>*NILGS, JAPAN*
- MP DESIGN AND CHARACTERIZATION OF A BIOMEDICAL DEVICE CAPABLE OF PICO-CI LEVEL BETA DETECTION FOR THE STUDY OF CELL METABOLISM  
Z.T.F. Yu, N.T. Vu, C.J. Shu, K. Kamei, R.W. Silverman, O.N. Witte, C.G. Radu, A.F. Chatzioannou and H.-R. Tseng  
*University of California at Los Angeles, USA*
- MP ELECTROFORMATION OF SOLVENT-FREE LIPID MEMBRANCES ON MICROAPERTURE ARRAY  
K. Kuribayashi and S. Takeuchi  
*The University of Tokyo, JAPAN*
- TP MICRONEEDLE ARRAYS FOR INTRACELLULAR RECORDING APPLICATIONS  
J. Held<sup>1</sup>, J. Gaspar<sup>1</sup>, P.J. Koester<sup>2</sup>, C. Tautorat<sup>3</sup>, A. Cismak<sup>3</sup>, A. Heilman<sup>3</sup>, W. Bauman<sup>2</sup>, P. Ruther<sup>1</sup> and O. Paul<sup>1</sup>  
<sup>1</sup>*University of Freiburg, GERMANY*, <sup>2</sup>*University of Rostock, GERMANY* and <sup>3</sup>*Fraunhofer Institute for Mechanics of Materials, GERMANY*
- TP BOTH PNEUMATIC AND MAGNETIC MANIPULATION OF SCATTERED CELLS ON MICRO CHANNEL ARRAY FOR CELLULAR ANALYSIS  
T. Hiranishi<sup>1</sup>, W. Tonomura<sup>1</sup>, K. Ino<sup>2</sup>, M. Okochi<sup>2</sup>, H. Honda<sup>2</sup> and S. Konishi<sup>1</sup>  
<sup>1</sup>*Ritsumeikan University, JAPAN* and <sup>2</sup>*Nagoya University, JAPAN*
- TP ASSEMBLY OF SINGLE ADHERENT CELLS ON MOBILE MICROPLATES  
H. Onoe and S. Takeuchi  
*The University of Tokyo, JAPAN*
- WP A PDMS MICROFLUIDIC CHIP WITH NANOSTRUCTURES FOR BACTERIA CONCENTRATION AND FAST DETECTION  
J.J. Yu, L.D. Xiao and M. Yang  
*The Hong Kong Polytechnic University, HONG KONG*
- WP MICROCHIP FOR THE REGULATION OF SKELETAL MUSCLE DIFFERENTIATION  
Y. Zhao  
*The Ohio State University, USA*
- WP "HOUSING" FOR CELLS IN MONODISPERSE MICROCAGES  
Y. Morimoto, W. Tan and S. Takeuchi  
*The University of Tokyo, JAPAN*
- ThP TRANSFECTION OF MOLECULAR BEACONS IN MICROCHANNELS UNDER FLOW AND NO-FLOW CONDITIONS  
N. Li<sup>1</sup>, P.K. Wong<sup>2</sup>, J. Lin<sup>1</sup> and C.M. Ho<sup>1</sup>  
<sup>1</sup>*University of California at Los Angeles, USA* and <sup>2</sup>*University of Arizona, USA*
- ThP MULTILAYER PARYLENE-C STENCILS FOR DYNAMICALLY CONTROLLING CELL-CELL INTERACTIONS  
C.-L. Chen<sup>1</sup>, S. Jinno<sup>2</sup>, H. Moller<sup>2</sup>, S.-H. Chao<sup>1</sup>, S. Selvarasah<sup>1</sup>, A. Khademhosseini<sup>2</sup> and M.R. Dokmeci<sup>1</sup>  
<sup>1</sup>*Northeastern University, USA* and <sup>2</sup>*Harvard Medical School, USA*
- ThP A COMPACT MICROFLUIDIC CONTINUOUS FLOW SEPARATOR FOR PARTICLE AND CELL SORTING  
P.B. Lillehoj, N. Li, H. Tsutsui and C.M. Ho  
*University of California at Los Angeles, USA*
- ThP MEMS BASED SENSORS TO EXPLORE THE ROLE OF TENSION IN AXONS FOR NEURO-TRANSMISSION  
S. Yang, S. Siechen, J. Sung, A. Chiba and T. Saif  
*University of Illinois at Urbana-Champaign, USA*

## FABRICATION

- MP DESIGN AND CHARACTERIZATION OF A NOVEL ICP TOOL FOR HIGH SPEED AND HIGH ACCURACY DRIE PROCESSING  
H.W. Van Zeijl<sup>1</sup>, N. Launay<sup>2</sup> and P.M. Sarro<sup>1</sup>  
<sup>1</sup>*Delft University of Technology, THE NETHERLANDS* and <sup>2</sup>*Alcatel Micro Machining Systems, FRANCE*



- MP **AN IMPROVED ANISOTROPIC WET ETCHING PROCESS FOR THE FABRICATION OF SILICON MEMS STRUCTURES BY SINGLE ETCHING MASK**  
P. Pal<sup>1</sup>, K. Sato<sup>1</sup>, M.A. Gosalvez<sup>2</sup> and M. Shikida<sup>1</sup>  
<sup>1</sup>Nagoya University, JAPAN and <sup>2</sup>Helsinki University of Technology, FINLAND
- MP **TWO-DIMENSIONAL DENSE-ARRAYED PROBE-CARDS WITH A HOE-SHAPED PROBING-TIP MICROMACHINING TECHNIQUE**  
F. Wang, X.X. Li, H. Yang, Y. Wang, S. Feng and X. Ge  
Shanghai Institute of Microsystem and Information Technology, CHINA
- MP **POST-CMOS INTEGRATION TECHNOLOGY OF THICK-FILM SOI MEMS DEVICES USING MICRO BRIDGE INTERCONNECTIONS**  
H. Takao<sup>1,2</sup>, T. Ichikawa<sup>1</sup>, T. Nakata<sup>1</sup>, K. Sawada<sup>1,2</sup> and M. Ishida<sup>1,2</sup>  
<sup>1</sup>Toyohashi University of Technology, JAPAN and <sup>2</sup>JST-CREST, JAPAN
- MP **MICRO-ELECTRO-DISCHARGE MACHINING BY MEMS ACTUATORS WITH PLANAR ELECTRODES MICROFABRICATED ON THE WORK SURFACES**  
C.R. Alla Chaitanya and K. Takahata  
The University of British Columbia, CANADA
- MP **DIRECT PRINTING OF LEAD ZIRCONATE TITANATE THIN FILMS**  
S.P. Bathurst, H.W. Lee and S.G. Kim  
Massachusetts Institute of Technology, USA
- MP **INKJET PRINTING OF SU-8 FOR POLYMER-BASED MEMS; A CASE STUDY FOR MICROLENSES**  
V. Fakhfour, N. Cantale, G. Mermoud, J.Y. Kim, D. Boiko, E. Charbon, A. Martinoli and J. Brugger  
Ecole Polytechnique Fédérale de Lausanne, SWITZERLAND
- MP **BATCH FABRICATION OF POLYMER MICROSYSTEMS WITH SHAPE MEMORY MICROACTUATORS**  
T. Grund and M. Kohl  
Forschungszentrum Karlsruhe, GERMANY
- TP **HAREM: HIGH ASPECT RATIO ETCHING AND METALLIZATION**  
E. Sarajlic<sup>1</sup>, C. Yamahata<sup>1</sup>, M. Cordero<sup>1</sup>, D. Collard<sup>1,2</sup> and H. Fujita<sup>1</sup>  
<sup>1</sup>The University of Tokyo, JAPAN and <sup>2</sup>LIMMS/CNRS-IIS, JAPAN
- TP **SIWALL EPITAXIAL PIEZORESISTOR PROCESS FOR IN-PLANE SENSING APPLICATIONS**  
A.A. Barlian, N. Harjee, M. Vikram, T.H. Fung and B.L. Pruitt  
Stanford University, USA
- TP **FABRICATION OF MICROPROBES ON A ULTRATHICK GLASS SUBSTRATE WITH NARROW-PITCH ELECTRICAL FEEDTHROUGHS FOR NEXT-GENERATION LSI BURN-IN TESTS**  
S. Tanaka<sup>1</sup>, S. Fujimoto<sup>2</sup>, O. Itoh<sup>2</sup>, S.-H. Choe<sup>1</sup> and M. Esashi<sup>1</sup>  
<sup>1</sup>Tohoku University, JAPAN and <sup>2</sup>MEMS Core Co., Ltd., JAPAN
- TP **SURFACE NANOSTRUCTURING OF BIOCOMPATIBLE POLYMER FOR WETTABILITY CONTROL IN MEMS**  
K.S. Teh<sup>1</sup> and Y.W. Lu<sup>2</sup>  
<sup>1</sup>San Francisco State University, USA and <sup>2</sup>Rochester Institute of Technology, USA
- TP **REAL-TIME WIRELESS MONITORING OF WORKPIECE MATERIAL AND DEBRIS CHARACTERISTICS IN MICRO-ELECTRO-DISCHARGE MACHINING**  
M.T. Richardson and Y.B. Gianchandani  
University of Michigan, USA
- TP **A NEW PARADIGM FOR HIGH RESOLUTION 3D LITHOGRAPHY**  
L.A. Mosher<sup>1</sup>, C.M. Waits<sup>2</sup>, B. Morgan<sup>2</sup> and R. Ghodssi<sup>1</sup>  
<sup>1</sup>University of Maryland, College Park, USA and <sup>2</sup>US Army Research Laboratory, USA
- TP **A NOVEL METHOD TO FABRICATE LENSED OPTICAL FIBER WITH SU-8 PHOTORESIST FOR EFFICIENT COUPLING TO HIGH-POWER LASER DIODES**  
C.C. Wu, Y.T. Tseng and C.H. Lin  
National Sun Yat-Sen University, TAIWAN
- WP **LOW-VOLTAGE LARGE-VALUE TUNABLE CAPACITORS USING SELF-ALIGNED HARPSS**  
M. Rais-Zadeh, A.K. Samarao, P. Monajemi and F. Ayazi  
Georgia Institute of Technology, USA
- WP **FABRICATION METHOD OF SUB-MICROMETER SIZE PLANAR GAP FOR THE MICRO FABRY-PEROT INTERFEROMETER**  
T. Dohi, H. Hayashi, H. Onoe, K. Matsumoto and I. Shimoyama  
The University of Tokyo, JAPAN
- WP **FABRICATION AND EVALUATION OF V-SHAPED MOS TRANSISTOR PROBE WITH NANO TIP**  
S.H. Lee<sup>1</sup>, G. Lim<sup>1</sup>, H. Shin<sup>2</sup> and W. Moon<sup>1</sup>  
<sup>1</sup>Pohang University of Science and Technology, KOREA and <sup>2</sup>Kookmin University, KOREA
- WP **POST-HYDROPHILIC TREATMENT FREE PLASTIC BIOCHIP FABRICATION METHOD USING POLYUREA FILM**  
H. Shinohara<sup>1</sup>, Y. Takahashi<sup>2</sup>, J. Mizuno<sup>1</sup> and S. Shoji<sup>1</sup>  
<sup>1</sup>Waseda University, JAPAN and <sup>2</sup>So-Ken Co., Ltd., JAPAN
- WP **MASKLESS SELECTIVE ELECTROCHEMICALLY ASSISTED WET ETCHING OF METAL LAYERS FOR 3D MICROMACHINED SOI RF MEMS DEVICES**  
M. Sterner, N. Roxhed, G. Stemme and J. Oberhammer  
KTH – Royal Institute of Technology, SWEDEN





- WP AUTOMATED DYNAMIC MODE MULTIDIRECTIONAL UV LITHOGRAPHY FOR COMPLEX 3-D MICROSTRUCTURES  
J.K. Kim<sup>1</sup>, M.G. Allen<sup>2</sup> and Y.K. Yoon<sup>1</sup>  
<sup>1</sup>University at Buffalo, USA and <sup>2</sup>Georgia Institute of Technology, USA
- WP NEW METHODS FOR LIQUID ENCAPSULATION IN POLYMER MEMS STRUCTURES  
S. Matsumoto and N. Ichikawa  
National Institute of Advanced Industrial Science and Technology, JAPAN
- ThP OCTREE-SEARCH KINETIC MONTE CARLO ALGORITHM FOR THE SIMULATION OF COMPLEX 3D MEMS STRUCTURES  
Y. Xing<sup>1</sup>, M. Gosalvez<sup>2</sup> and K. Sato<sup>3</sup>  
<sup>1</sup>Southeast University, CHINA, <sup>2</sup>Helsinki University of Technology, FINLAND and <sup>3</sup>Nagoya University, JAPAN
- ThP FABRICATING CAPACITIVE MICROMACHINED ULTRASONIC TRANSDUCERS WITH DIRECT WAFER-BONDING AND LOCOS TECHNOLOGY  
K.K. Park, H.J. Lee, M. Kupnik, O. Oralkan and B.T. Khuri-Yakub  
Stanford University, USA
- ThP PARALLEL ELECTRON BEAM MICRO-COLUMN WITH SELF-ALIGNED CARBON NANOTUBE EMITTERS  
C.H. Tsai, J.Y. Ho, T. Ono and M. Esashi  
Tohoku University, JAPAN
- ThP MICRO-MACHINED MICRO ION SOURCE FOR FLEXIBLE AND CONCURRENT PROCESS  
S. Tamonoki, H. Kuwano and S. Nagasawa  
Tohoku University, JAPAN
- ThP ATOMIC LAYER DEPOSITED ALUMINA FOR MICROMACHINED RESONATORS  
Y.J. Chang, K. Cobry and V.M. Bright  
University of Colorado at Boulder, USA
- ThP CONTACT LENS WITH INTEGRATED INORGANIC SEMICONDUCTOR DEVICES  
H. Ho, E. Saeedi, S.S. Kim, T. Shen and B.A. Parviz  
University of Washington, USA
- ThP SEALING METHOD OF PDMS AS ELASTIC MATERIAL FOR MEMS  
S. Sawano<sup>1</sup>, K. Naka<sup>1</sup>, A. Werber<sup>2</sup>, H. Zappe<sup>2</sup> and S. Konishi<sup>1</sup>  
<sup>1</sup>Ritsumeikan University, JAPAN and <sup>2</sup>University of Freiburg, GERMANY

## MATERIAL CHARACTERIZATION

- MP HIGH-THROUGHPUT WAFER-SCALE MICROTENSILE TESTING OF THIN FILMS  
J. Gaspar, M. Schmidt, J. Held and O. Paul  
University of Freiburg, GERMANY
- MP EXPERIMENTAL STUDY ON THE DIELECTRIC-DEFORMATION BEHAVIOR OF SiO<sub>2</sub> IN A SANDWICH STRUCTURE  
J.-Q. Huang, X.-D. Huang, Q.-A. Huang and M. Qin  
Southeast University, CHINA
- TP DETERMINATION OF THE PIEZORESISTIVITY OF MICROCRYSTALLINE SILICON-GERMANIUM AND APPLICATION TO A PRESSURE SENSOR  
S. Lenci<sup>1</sup>, P. Gonzalez<sup>2</sup>, K. De Meyer<sup>3</sup>, R. Van Hoof<sup>3</sup>, D. Frederickx<sup>3</sup> and A. Witvrouw<sup>3</sup>  
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- TP DEVELOPEMENT OF BI-AXIAL TENSILE TESTER TO INVESTIGATE YIELD LOCUS FOR ALUMINUM FILM UNDER MULTI-AXIAL STRESSES  
Y. Nagai<sup>1</sup>, T. Namazu<sup>1</sup>, N. Araki<sup>1</sup>, Y. Tomizawa<sup>2</sup> and S. Inoue<sup>1</sup>  
<sup>1</sup>University of Hyogo, JAPAN and <sup>2</sup>Toshiba Corporation, JAPAN
- WP PREDICTION OF FATIGUE LIFETIME BASED ON STATIC STRENGTH AND CRACK EXTENSION LAW - FATIGUE TEST OF MEMS MATERIALS BECOMES UNNECESSARY  
T. Kawai<sup>1</sup>, S. Kamiya<sup>1</sup>, S. Amaki<sup>1</sup>, O. Paul<sup>2</sup>, P. Ruther<sup>2</sup> and J. Gaspar<sup>2</sup>  
<sup>1</sup>Nagoya Institute of Technology, JAPAN and <sup>2</sup>University of Freiburg, GERMANY
- TP CLOSELY SPACED POLYMER MICROSTRUCTURES AS A UNIQUE TOOL FOR CHARACTERIZATION AT THE SMALL SCALES  
Y. Zhao  
The Ohio State University, USA
- WP MECHANICAL CHARACTERIZATION OF SiC FILM AT HIGH TEMPERATURES BY TENSILE TEST  
S. Nakao<sup>1</sup>, T. Ando<sup>1</sup>, L. Chen<sup>2</sup>, M. Mehregany<sup>2</sup> and K. Sato<sup>1</sup>  
<sup>1</sup>Nagoya University, JAPAN and <sup>2</sup>Case Western Reserve University, USA
- ThP CRYSTAL ORIENTATION DEPENDENCE OF FATIGUE CHARACTERISTICS IN SINGLE CRYSTAL SILICON MEASURED USING A ROTATING MICRO RESONATOR  
T. Ikehara<sup>1</sup> and T. Tsuchiya<sup>2</sup>  
<sup>1</sup>National Institute of Advanced Industrial Science and Technology, JAPAN and <sup>2</sup>Kyoto University, JAPAN
- ThP MEASUREMENT AND EVALUATION FOR INTERFACE THERMAL RESISTANCE OF METAL-DIELECTRIC LAYERS  
H.C. Chien<sup>1</sup> and D.-J. Yao<sup>2</sup>  
<sup>1</sup>Industrial Technology Research Institute, TAIWAN and <sup>2</sup>National Tsing Hua University, TAIWAN



## MICROACTUATORS

- MP DEVELOPMENT OF NOVEL CASCADE STRUCTURE FOR IMPROVING STROKE OF ELECTROSTATIC COMB-DRIVE ACTUATOR  
J.C. Chiou, C.F. Kuo, Y.J. Lin, C.W. Chang and K.C. Hou  
*National Chiao Tung University, TAIWAN*
- MP LARGE ANGLE SOI TILTING ACTUATOR WITH INTEGRATED MOTION TRANSFORMER AND AMPLIFIER  
A. Ya'akobovitz, S. Krylov and Y. Shacham-Diamand  
*Tel-Aviv University, ISRAEL*
- MP PERFORMANCE CHARACTERIZATION OF MINIATURIZED DIELECTRIC ELASTOMER ACTUATORS FABRICATED USING METAL ION IMPLANTATION  
S. Rosset, M. Niklaus, P. Dubois and H.R. Shea  
*Ecole Polytechnique Fédérale de Lausanne, SWITZERLAND*
- MP ELECTROTHERMAL MICROGRIPPER WITH LARGE JAWS DISPLACEMENT AND INTEGRATED FORCE SENSORS  
T. Chu Duc, G.K. Lau, J.F. Creemer and P.M. Sarro  
*Delft University of Technology, THE NETHERLANDS*
- MP A NOVEL SELF-HEATING PARAFFIN MEMBRANE MICRO-ACTUATOR  
F. Goldschmidtboeing, P. Katus, A. Geipel and P. Woias  
*University of Freiburg, GERMANY*
- TP FABRICATION OF POLYMER-BASED VERTICAL COMB DRIVE USING A DOUBLE-SIDE MULTIPLE PARTIAL EXPOSURE METHOD  
J. Chung and W. Hsu  
*National Chiao Tung University, TAIWAN*
- TP PREDICTING THE SWITCHING TIME OF ELECTROSTATIC ACTUATORS  
V. Leus and D. Elata  
*Technion - Israel Institute of Technology, ISRAEL*
- TP MEASUREMENT AND MODELING OF FRICTION IN LINEAR AND ROTARY MICROMOTORS SUPPORTED ON MICROBALL BEARINGS  
N. Ghalichechian, M. McCarthy, M.I. Beyaz and R. Ghodssi  
*University of Maryland, USA*
- TP A PIEZOELECTRICALLY-DRIVEN HIGH FLOW RATE AXIAL POLYMER MICROVALVE WITH SOLID HYDRAULIC AMPLIFICATION  
X Wu, S.-H. Kim and C.-H. Ji  
*Georgia Institute of Technology, USA*
- TP LARGE DEFORMATION BALLOON MICRO-ACTUATOR BASED ON PYROTECHNICS ON CHIP  
D. Briand<sup>1</sup>, P. Dubois<sup>2</sup>, L.-E. Bonjour<sup>2</sup>, L. Guillot<sup>1</sup>, U. Bley<sup>3</sup>, S. Danninger<sup>3</sup>, S. Rosset<sup>2</sup>, H. Shea<sup>2</sup> and N.F. de Rooij<sup>1</sup>  
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- WP LARGE DISPLACEMENT LOW VOLTAGE MULTI-STABLE ACTUATOR  
Y. Gerson<sup>1</sup>, S. Krylov<sup>1</sup>, B. Ilic<sup>2</sup> and D. Schreiber<sup>1</sup>  
<sup>1</sup>*University of Tel Aviv, ISRAEL* and <sup>2</sup>*Cornell University, USA*
- WP MAGNETIC COMB DRIVE ACTUATOR  
S. Schonhardt<sup>1</sup>, J.G. Korvink<sup>1</sup>, J. Mohr<sup>2</sup>, U. Hollebach<sup>2</sup> and U. Wallrabe<sup>1</sup>  
<sup>1</sup>*University of Freiburg, GERMANY* and <sup>2</sup>*University of Karlsruhe, GERMANY*
- WP CHARACTERIZATION OF SILICON PARALLEL PLATE ELECTROSTATIC ACTUATOR IN PARTIALLY CONDUCTING AQUEOUS SOLUTION  
H.V. Panchawagh<sup>1</sup>, T.L. Sounart<sup>2</sup>, A. Kausik<sup>1</sup>, D.S. Finch<sup>3</sup> and R.L. Mahajan<sup>3</sup>  
<sup>1</sup>*University of Colorado, Boulder, USA*, <sup>2</sup>*Sandia National Laboratories, USA* and <sup>3</sup>*Virginia Tech, USA*
- WP NON-CONTACT ELECTROSTATIC MICRO-BEARING USING POLYMER ELECTRET  
Y. Tsurumi, Y. Suzuki and N. Kasagi  
*The University of Tokyo, JAPAN*
- WP BRAILLE CODE DISPLAY DEVICE WITH A PDMS MEMBRANE AND THERMOPNEUMATIC ACTUATOR  
H.J. Kwon, S.W. Lee and S.S. Lee  
*Korea Advanced Institute of Science and Technology, KOREA*
- WP OPTICAL DRIVEN MASTER-SLAVE CONTROLABLE NANO-MANIPULATOR WITH REAL-TIME FORCE SENSING  
K. Ikuta, F. Sato, K. Kadoguchi and S. Itoh  
*Nagoya University, JAPAN*
- ThP MODELING AND EXPERIMENTAL VALIDATION OF ELECTROSTATIC ACTUATION IN AQUEOUS IONIC MEDIA  
V. Mukundan, P. Ponce, H.E. Butterfield and B.L. Pruitt  
*Stanford University, USA*
- ThP TOWARD AN AUTONOMOUS ELECTROSTATIC MICROMOTOR: INTEGRATED FEEDBACK CONTROL  
M.I. Beyaz, N. Ghalichechian and R. Ghodssi  
*University of Maryland, College Park, USA*
- ThP PULL-IN BEHAVIOR AND MULTISTABILITY OF A CURVED MICROBEAM ACTUATED BY A DISTRIBUTED ELECTROSTATIC FORCE  
S. Krylov, S. Seretensky and D. Schreiber  
*Tel Aviv University, ISRAEL*
- ThP CMOS-MEMS PROBES FOR RECONFIGURABLE IC'S  
J. Liu, M. Norman, J.A. Bain, T.E. Schlesinger and G.K. Fedder  
*Carnegie Mellon University, USA*



## MICROFLUIDIC COMPONENTS &amp; SYSTEMS

- MP ELECTRICALLY TUNABLE ALIRBORNE PARTICLE CLASSIFER USING A VIRTUAL IMPACTOR  
Y.H. Kim, D. Park, J. Hwang and Y.J. Kim  
*Yonsei University, KOREA*
- MP DIRECT TRANSPORTATION AND ELECTROFUSION OF OIL DROPLETS IN A MICROFLUIDIC DEVICE  
C. Bottier<sup>1,2</sup>, M.C. Tarhan<sup>2</sup>, J. Fattaccioli<sup>1,2</sup>, F.O. Morin<sup>2</sup>, B. Kim<sup>2</sup> and H. Fujita<sup>2</sup>  
<sup>1</sup>LIMMS - CNRS, JAPAN and <sup>2</sup>IIS-CIRRM, JAPAN
- MP DESIGN SYNTHESIS AND EXPERIMENTAL VALIDATION OF MICROFLUIDIC CONCENTRATION GRADIENT GENERATORS  
Y. Zhou<sup>1</sup>, Y. Wang<sup>2</sup>, T. Mukherjee<sup>3</sup> and Q. Lin<sup>1</sup>  
<sup>1</sup>Columbia University, USA, <sup>2</sup>CFD Research Corporation, USA and <sup>3</sup>Carnegie Mellon University, USA
- MP ELECTROHYDRODYNAMIC ENHANCED TRANSPORT AND TRAPPING OF AIRBORNE PARTICLES TO A MICROFLUIDIC AIR-LIQUID INTERFACE  
N. Sandström, T. Frisk, G. Stemme and W. van der Wijngaart  
*KTH - Royal Institute of Technology, SWEDEN*
- MP ALIQUOTING STRUCTURE FOR CENTRIFUGAL MICROFLUIDICS BASED ON A NEW PNEUMATIC VALVE  
D.L. Mark<sup>1</sup>, S. Haeberle<sup>2</sup>, T. Metz<sup>1</sup>, S. Lutz<sup>1</sup>, J. Ducrée<sup>2</sup>, R. Zengerle<sup>1,2</sup> and F. von Stetten<sup>1</sup>  
<sup>1</sup>University of Freiburg, GERMANY and <sup>2</sup>Institute for Micromachining and Information Technology, GERMANY
- MP A NOVEL VALVE FOR MICROFLUIDIC PDMS-BASED SYSTEMS  
I. Klammer, A. Buchenauer, G. Dura, W. Mokwa and U. Schnakenberg  
*Institute of Materials in Electrical Engineering I, GERMANY*
- MP DIELECTRIC DROPLET MANIPULATIONS BY ELECTROPOLARIZATION FORCES  
T.H. Hsieh and S.K. Fan  
*National Chiao Tung University, TAIWAN*
- TP DROPLET AND PARTICLE MANIPULATION IN EMULSIONS AND SUSPENSIONS BY USING 3D ELECTRO-OSMOTIC MICROPUMPS  
W. Hilber, B. Weiss, M. Mikolasek, R. Holly, K. Hingerl and B. Jakoby  
*Johannes Kepler University Linz, AUSTRIA*
- TP MICROMACHINED ELELCTRICAL MOBILITY ANALYZER  
I.-H. Jung, D. Park, Y.-H. Kim, J. Hwang and Y.-J. Kim  
*Yonsei University, KOREA*
- TP NANOPOROUS DEVICE FOR ACCURATE DOSE CONTROL IN HIGH THROUGHPUT SCREENING  
S. Upadhyaya and P.R. Selvaganapathy  
*McMaster University, CANADA*
- TP CONTINUOUS FLOW SWITCHING BY PNEUMATIC ACTUATION OF THE AIR LUBRICATION LAYER ON SUPERHYDROPHOBIC MICROCHANNEL WALLS  
C.F. Carlborg, M. Do-Quang, G. Stemme, G. Amberg and W. van der Wijngaart  
*KTH - Royal Institute of Technology, SWEDEN*
- TP NANO- LIPID MONODISPERSED DROPLETS FORMATION BASED ON FLOW INSTABILITY  
Y.D. Wen, I.D. Yang, S.Y. Changcheng, C.C. Chieng and F.G. Tseng  
*National Tsing Hua University, TAIWAN*
- TP NON-EQUILIBRIUM ELECTROKINETIC NANOFLUIDIC MIXERS  
D. Kim, A. Raj, L. Zhu, R.I. Masel and M.A. Shannon  
*University of Illinois at Urbana-Champaign, USA*
- TP DROPLET MANIPULATION ON HIGH-OPENING MICRO FILTER MESHES  
Y. Zhao and S.K. Cho  
*University of Pittsburgh, USA*
- WP APPLICATION OF VORTICELLA'S FEEDING MECHANISM AS A MICROMIXER -CHARACTERIZATION OF VORTICES GENERATED BY CILIA MOTION  
M. Nagai, M. Oishi, N. Sakakai, O. Ducloux, M. Oshima, H. Asai and H. Fujita  
*The University of Tokyo, JAPAN*
- WP PIV INVESTIGATION OF 3-DIMENSIONAL FLOW IN DROPS ACTUATED BY EWOD  
H.-W. Lu<sup>1</sup>, F. Bottausci<sup>2</sup>, J. Fowler<sup>1</sup>, A.L. Bertozzi<sup>1</sup>, C.D. Meinhart<sup>2</sup> and C.-J. Kim<sup>1</sup>  
<sup>1</sup>University of California at Los Angeles, USA and <sup>2</sup>University of California, Santa Barbara, USA
- WP ON-CHIP CHARACTERIZATION OF TRANSPORT PROPERTIES OF LIQUID SOLUTIONS USING MICROFLUIDIC CHANNEL-BASED BROWNIAN MICROSCOPY  
J. Kim and Y.S. Ju  
*University of California at Los Angeles, USA*
- WP VIBRATION INDUCED DROPLET GENERATION ON TEXTURED SURFACES  
E.Y. Erdem, R. Baskaran and K.B. Böhringer  
*University of Washington, USA*
- WP MICROMACHINED SAMPLE DIVIDER FOR ANALYZING BIOCHEMICAL REACTION BASED ON SINGLE MOLECULE  
M. Koyama, R. Imai, M. Shikida, M. Okouchi, H. Tsuchiya, H. Honda and K. Sato  
*Nagoya University, JAPAN*



- WP **NEAR-WALL VELOCITY OF SUSPENDED PARTICLES IN MICROCHANNEL FLOW**  
W.L.W. Hau<sup>1</sup>, Z. Liu<sup>1</sup>, J. Korvink<sup>1</sup>, R. Zengerle<sup>1</sup> and J. Duccrée<sup>2</sup>  
<sup>1</sup>University of Freiburg, GERMANY and <sup>2</sup>HSG-IMIT, GERMANY
- WP **A RESETTABLE DYNAMIC MICROFLUIDIC DEVICE**  
K. Iwai, W. Tan and S. Takeuchi  
The University of Tokyo, JAPAN
- ThP **ADDRESSABLE FLUIDIC GATE ARRAYS FOR LAYER-TO-LAYER PARALLEL FLUIDIC TRANSPORTATION SYSTEM**  
T. Morimoto and S. Konishi  
Ritsumeikan University, JAPAN
- ThP **BIDIRECTIONAL TRANSPORT OF KINESIN OR DYNEIN-COATED MICROSPHERES ON POLAR ORIENTED MICROTUBULES**  
R. Yokokawa<sup>1</sup>, M.C. Tarhan<sup>2</sup>, T. Kon<sup>2</sup> and H. Fujita<sup>2</sup>  
<sup>1</sup>Ritsumeikan University, JAPAN and <sup>2</sup>The University of Tokyo, JAPAN
- ThP **FLOATING-DISK PARYLENE MICROVALVE FOR SELF-REGULATING BIOMEDICAL FLOW CONTROLS**  
P.-J. Chen<sup>1</sup>, D.C. Rodger<sup>2</sup>, M.S. Humayun<sup>2</sup> and Y.-C. Tai<sup>1</sup>  
<sup>1</sup>California Institute of Technology, USA and <sup>2</sup>University of Southern California, USA
- ThP **ELECTROSTATIC DROPLET MANIPULATION USING ELECTRET AS A VOLTAGE SOURCE**  
T. Wu, Y. Suzuki and N. Kasagi  
The University of Tokyo, JAPAN
- ThP **WRISTBAND-LIKE DROPLET PLATFORM BY DIGITAL MICROFLUIDIC MODULARIZATIONS**  
H. Yang, S.-K. Fan and W. Hsu  
National Chiao Tung University, TAIWAN
- ThP **A TWO-DIMENSIONAL PARTICLE FOCUSING CHANNEL USING THE POSITIVE DIELECTROPHORESIS (PDEP) GUIDED BY A DIELECTRIC STRUCTURE BETWEEN TWO PLANAR ELECTRODES**  
H.J. Chu, I. Doh and Y.-H. Cho  
Korea Advanced Institute of Science and Technology, KOREA
- ThP **DYNAMIC MAGNETIC MANIPULATION USING ELECTRIC FIELD ADDRESSED FERROFLUIDIC DROPLETS**  
C. Pan<sup>1</sup>, S. Park<sup>1</sup>, L. Gao<sup>2</sup> and E. Chiou<sup>1</sup>  
<sup>1</sup>University of California at Los Angeles, USA and <sup>2</sup>Zhejiang University, CHINA

## MICRORESONATORS

- MP **A SURFACE ACOUSTIC WAVE DYNAMIC CONTROL DEVICE BY GRATING STRUCTURE**  
M. Miyashita, S. Nagasawa and H. Kuwano  
Tohoku University, JAPAN
- TP **LINEAR TUNING OF RESONANCE FREQUENCY IN TILTING OSCILLATORS BY AN AXIALLY LOADED SUSPENSION FLEXURE**  
T. Shmilovich and S. Krylov  
Tel Aviv University, ISRAEL
- WP **HIGH-Q AND CMOS COMPATIBLE SINGLE CRYSTAL SILICON CANTILEVER WITH SEPARATED ON-CHIP PIEZOELECTRIC ACTUATOR FOR ULTRA-SENSITIVE MASS DETECTION**  
J. Lu<sup>1</sup>, T. Ikehara<sup>1</sup>, Y. Zhang<sup>1</sup>, T. Mihara<sup>2</sup>, T. Itoh<sup>1</sup> and R. Maeda<sup>1</sup>  
<sup>1</sup>National Institute of Advanced Industrial Science and Technology, JAPAN and <sup>2</sup>Olympus Corp., JAPAN
- ThP **A NEW METHOD TO DETERMINE THE MECHANICAL RESONANCE FREQUENCY, QUALITY FACTOR AND CHARGING IN ELECTROSTATICALLY ACTUATED MEMS**  
S. Kalicinski<sup>1,2</sup>, H.A.C. Tilmans<sup>1</sup>, M. Wevers<sup>2</sup> and I. De Wolf<sup>1,2</sup>  
<sup>1</sup>IMEC, BELGIUM and <sup>2</sup>Katholieke Universiteit Leuven, BELGIUM
- ThP **PIEZOELECTRICALLY DRIVEN SPHERICALLY CONTOURED RESONATORS IN LGS FOR HIGH TEMPERATURE APPLICATIONS**  
E. Ansorge<sup>1</sup>, B. Schmidt<sup>1</sup>, J. Sauerwald<sup>2</sup> and H. Fritze<sup>2</sup>  
<sup>1</sup>University of Magdeburg, GERMANY and <sup>2</sup>Harz University of Applied Studies and Research, GERMANY

## NEMS (NANO ELECTRO MECHANICAL SYSTEMS)

- MP **SPEED PERFORMANCE AND CONTROL OF MICROMACHINED LINEAR BROWNIAN MOTOR**  
E. Altintas<sup>1</sup>, E. Sarajlic<sup>1</sup>, K.F. Bohringer<sup>2</sup> and H. Fujita<sup>1</sup>  
<sup>1</sup>The University of Tokyo, JAPAN and <sup>2</sup>University of Washington, USA
- MP **FABRICATION OF FREE-STANDING FULLERENE NANOWIRE USING DIRECT ELECTRONBEAM WRITING AND SACRIFICIAL DRY ETCHING**  
T. Tsuchiya, T. Jomori, Y. Ura, K. Sugano and O. Tabata  
Kyoto University, JAPAN
- MP **A PLASMONIC SWITCH BASED ON ORDERED AU NANODISK ARRAY AND PHOTORESPONSIVE LIQUID CRYSTALS**  
Y.B. Zheng, V. Hsiao and T.J. Huang  
Pennsylvania State University, USA
- MP **SILICON NANOWIRE COUPLED MICRO-RESONATORS**  
N. Arellano<sup>1</sup>, E.P. Quevy<sup>2</sup>, J. Provine<sup>3</sup>, R. Maboudian<sup>1</sup> and R.T. Howe<sup>3</sup>  
<sup>1</sup>University of California, Berkeley, USA, <sup>2</sup>Silicon Clocks, Inc., USA and <sup>3</sup>Stanford University, USA



- MP FLEXURE-BASED NANOMAGNETIC ACTUATORS AND THEIR ULTIMATE SCALING LIMITS  
D.J. Vasquez<sup>1</sup> and J.W. Judy<sup>2</sup>  
<sup>1</sup>University of California, Berkeley, USA and <sup>2</sup>University of California, Los Angeles, USA
- TP SINGLE DNA MOLECULE MANIPULATION BY A SELF-ASSEMBLED MOTOR PROTEIN SYSTEM  
J. Miwa<sup>1</sup>, M.C. Tarhan<sup>2</sup>, H. Fujita<sup>2</sup>, M. Kasahara<sup>1</sup> and R. Yokokawa<sup>1</sup>  
<sup>1</sup>Ritsumeikan University, JAPAN and <sup>2</sup>The University of Tokyo, JAPAN
- TP RAPID, LOCALIZED SYNTHESIS OF TITANIUM-BASED NANOSWORDS ON MEMS  
B.D. Sosnowchik, J.-Y. Ha, L. Luo and L. Lin  
University of California at Berkeley, USA
- TP NANOPOROUS POLYMERIC STRUCTURES: FABRICATION AND APPLICATIONS IN BIOSENSING AND DRUG DELIVERY  
W. Yan, V. Hsiao, Y.B. Zheng and T.J. Huang  
Pennsylvania State University, USA
- TP ACTIVATION OF CNT NANO-TO-MICRO CONTACT VIA ELECTRICAL BREAKDOWN  
Y.Q. Jiang, Q.H. Zhang, T. Kawano, C.Y. Cho and L.W. Lin  
University of California at Berkeley, USA
- TP A PECVD CNT-BASED OPEN ARCHITECTURE FIELD IONIZER FOR PORTABLE MASS SPECTROMETRY  
L.F. Velasquez-Garcia and A.I. Akinwande  
Massachusetts Institute of Technology, USA
- WP SILICON NANOTWEEZERS: A NEW BIOPHYSICAL TOOL FOR MOLECULAR EXPERIMENTATION  
C. Yamahata<sup>1</sup>, D. Collard<sup>1,2</sup>, A. Domenget<sup>3</sup>, M. Hosogi<sup>4</sup>, M. Kumemura<sup>1</sup>, G. Hashiguchi<sup>4</sup> and H. Fujita<sup>1</sup>  
<sup>1</sup>The University of Tokyo, JAPAN, <sup>2</sup>LIMMS/CNRS-IIS, JAPAN, <sup>3</sup>Ecole Normal Supérieure de Cachan, FRANCE and <sup>4</sup>Kagawa University, JAPAN
- WP CARBON NANOTUBE ARRAYS ON FLEXIBLE SUBSTRATE AND THEIR FIELD EMISSION CHARACTERISTICS  
T.H. Chen, S.Y. Lu, C.M. Lin, W.K. Hsu and W. Fang  
National Tsing Hua University, TAIWAN
- WP BATCH FABRICATION OF CARBON NANOTUBES ON AFM PROBE TIPS AND AFM IMAGING  
K. Takagahara, Y. Takei, E. Iwase, K. Matsumoto and I. Shimoyama  
The University of Tokyo, JAPAN
- WP HIGH PRECISION FLUIDIC ALIGNMENT OF CARBON NANOTUBES USING MAGNETIC ATTRACTION ON A METAL CATALYST  
J.S. Shim, Y.H. Yun, M.J. Rust, J. Do, V. Shanov, M.J. Schulz and C.H. Ahn  
University of Cincinnati, USA
- WP MODELING AND EXPERIMENTAL STUDY OF NANO-ELECTROMECHANICAL OSCILLATOR USING SINGLE ZINC OXIDE NANOWIRE  
R. Zhu, D.Q. Wang, S.Q. Xiang, Z.Y. Zhou and X.Y. Ye  
Tsinghua University, CHINA
- ThP OXIDE CHARGING AND MEMORY EFFECTS IN SUSPENDED GATE FET  
D. Molinero<sup>1</sup>, N. Abele<sup>2</sup>, L. Castaner<sup>1</sup> and A. Ionescu<sup>3</sup>  
<sup>1</sup>UPC, SPAIN, <sup>2</sup>ST Microelectronics, FRANCE and <sup>3</sup>Ecole Polytechnique Fédérale de Lausanne, SWITZERLAND
- ThP MICROFABRICATION OF NANOPORE DEVICES WITHOUT NANOLITHOGRAPHY  
L. Chen, Y. Wang and C.H. Mastrangelo  
Case Western Reserve University, USA
- ThP PIEZORESISTIVE EFFECT IN TOP-DOWN FABRICATED SILICON NANOWIRES  
K. Reck, J. Richter, O. Hansen and E.V. Thomsen  
Technical University of Denmark, DENMARK
- ThP TEMPERATURE-DEPENDENT PROPERTIES OF AN INDIVIDUAL MEMS-INTEGRATED SINGLE-WALLED CARBON NANOTUBE  
A. Jungen, J. Gauckler, C. Stampfer, L. Durrer, T. Helbling and C. Hierold  
ETH Zurich, SWITZERLAND

## OPTICAL MEMS

- MP A LARGE-APERTURE, PISTON-TIP-TILT MICROMIRROR FOR OPTICAL PHASE ARRAY APPLICATIONS  
L. Wu<sup>1</sup>, S. Maley<sup>2</sup>, T. Nelson<sup>2</sup>, P. McManamon<sup>2</sup> and H. Xie<sup>1</sup>  
<sup>1</sup>University of Florida, USA and <sup>2</sup>Air Force Research Laboratory, USA
- MP SCANNING MICROMIRROR USING DEFORMATION OF A PARYLENE-ENCAPSULATED LIQUID STRUCTURE  
Y. Yoshihata, B.K. Nguyen, A. Takei, E. Iwase, K. Matsumoto and I. Shimoyama  
The University of Tokyo, JAPAN
- MP NANOSECOND-LEVEL WAVELENGTH TUNING USING MEMS COUPLED-CAVITY LASER  
H. Cai<sup>1</sup>, X.M. Zhang<sup>1</sup>, J. Tamil<sup>1</sup>, Q.X. Zhang<sup>2</sup> and A.Q. Liu<sup>1</sup>  
<sup>1</sup>Nanyang Technological University, SINGAPORE and <sup>2</sup>Institute of Microelectronics, SINGAPORE
- TP PACKAGED MEMS MICROMIRRORS FOR CRYOGENIC ENVIRONMENT  
S. Waldis<sup>1</sup>, F. Zamkotsian<sup>2</sup>, P. Lanzoni<sup>2</sup>, W. Noell<sup>1</sup> and N. de Rooij<sup>1</sup>  
<sup>1</sup>University of Neuchâtel, SWITZERLAND and <sup>2</sup>Laboratoire d'Astrophysique de Marseille, FRANCE



- TP **TUNABLE SPR COUPLER BY FLEXIBLE POLYMER GRATING**  
T. Kan, B.K. Nguyen, K. Matsumoto and I. Shimoyama  
*The University of Tokyo, JAPAN*
- TP **RUBIDIUM VAPOR CELL WITH INTEGRATED NONMETALLIC MULTILAYER REFLECTORS**  
M.A. Perez<sup>1</sup>, U. Nguyen<sup>2</sup>, A.M. Shkel<sup>1</sup>, S. Knappe<sup>3</sup>, E. Donley<sup>3</sup> and J. Kitching<sup>3</sup>  
<sup>1</sup>University of California, Irvine, USA, <sup>2</sup>University of California, Berkeley, USA and <sup>3</sup>NIST Boulder, USA
- WP **MICRO-MIRROR ON RIBBON-ACTUATOR (MOR) FOR HIGH SPEED SPATIAL LIGHT MODULATOR**  
J. Suzuki, A. Komai, Y. Ohuchi, Y. Tezuka, H. Konishi, M. Nishiyama, Y. Suzuki and S. Owa  
*Nikon Corporation, JAPAN*
- WP **ACTIVE SWITCHING OF SURFACE PLASMON POLARITON USING MEMS ACTUATORS**  
X.M. Zhang, W.M. Zhu and A.Q. Liu  
*Nanyang Technological University, SINGAPORE*
- WP **TAPERED WAVEGUIDE BY LIQUID FOR A COUPLER OF OPTICAL FIBERS TO MEMS DEVICES**  
H. Terae, E. Iwase, K. Matsumoto and I. Shimoyama  
*The University of Tokyo, JAPAN*
- ThP **THERMALLY ACTUATED ORGANIC DISPLAY DEVICE USING THERMO-CHROMATIC POLYMER COMPOSITE FILM WITH SELF-ALIGNED PATTERNS**  
O. Yarimaga, M. Im, B. Gu, T.W. Kim, Y.K. Jung, H.G. Park and Y.K. Choi  
*Korea Advanced Institute of Science and Technology, KOREA*
- ThP **RECONFIGURABLE FILTERS USING MEMS RESONATORS AND INTEGRATED OPTICAL MICROCAVITIES**  
M.W. Pruessner<sup>1</sup>, T.H. Stievater<sup>2</sup> and W.S. Rabinovich<sup>2</sup>  
<sup>1</sup>SFA Inc., USA and <sup>2</sup>Naval Research Lab, USA
- ThP **MEMS OPTICAL TUNNELING STRUCTURE FOR THERMO-OPTIC SWITCHING**  
W.M. Zhu<sup>1</sup>, X.M. Zhang<sup>1</sup>, T. Zhong<sup>2</sup> and A.Q. Liu<sup>1</sup>  
<sup>1</sup>Nanyang Technological University, SINGAPORE and <sup>2</sup>Massachusetts Institute of Technology, USA

## PACKAGING & ASSEMBLY

- MP **IMPLEMENTATION OF SOG DEVICES WITH EMBEDDED THROUGH-WAFER SILICON VIAS USING A GLASS REFLOW PROCESS FOR WAFER-LEVEL 3D MEMS INTEGRATION**  
C.W. Lin<sup>1</sup>, C.P. Hsu<sup>1</sup>, H.A. Yang<sup>2</sup>, W.C. Wang<sup>2</sup> and W. Fang<sup>1</sup>  
<sup>1</sup>National Tsing Hua University, TAIWAN and <sup>2</sup>Advanced Semiconductor Engineering, Inc., TAIWAN
- MP **LOW-POWER HERMETICALLY SEALED ON-CHIP PLASMA LIGHT SOURCE MICROMACHINED IN GLASS**  
P. Carazzetti, P.H. Renaud and H. Shea  
*Ecole Polytechnique Fédérale de Lausanne, SWITZERLAND*
- MP **MANIPULATION SYSTEM FOR NANO/MICRO COMPONENTS INTEGRATION VIA TRANSPORTATION AND SELF-ASSEMBLY**  
Y. Higuchi, T. Kusakabe, T. Tanemura, K. Sugano, T. Tsuchiya and O. Tabata  
*Kyoto University, JAPAN*
- MP **VARIABLE THERMAL RESISTORS (VTR) FOR THERMAL MANAGEMENT OF CHIP SCALE ATOMIC CLOCKS (CSAC)**  
H.-S. Kim, H.-H. Liao, H.O. Song and T.W. Kenny  
*Stanford University, USA*
- TP **GOLD-INDIUM TRANSIENT LIQUID PHASE (TLP) WAFER BONDING FOR MEMS VACUUM PACKAGING**  
W.C. Welch III and K. Najafi  
*University of Michigan, USA*
- TP **DEBRIS-FREE IN-AIR LASER DICING FOR MULTI-LAYER MEMS BY PERFORATED INTERNAL TRANSFORMATION AND THERMALLY-INDUCED CRACK PROPAGATION**  
Y. Izawa<sup>1</sup>, S. Tanaka<sup>2</sup>, H. Kikuchi<sup>2</sup>, Y. Tsurumi<sup>1</sup>, N. Miyanaga<sup>1</sup>, M. Esashi<sup>2</sup> and M. Fujita<sup>3</sup>  
<sup>1</sup>Osaka University, JAPAN, <sup>2</sup>Tohoku University, JAPAN and <sup>3</sup>Institute for Laser Technology, JAPAN
- TP **A MULTISTAGE IN-PLANE MICRO-THERMOELECTRIC COOLER**  
A.J. Gross, G. Hwang, B. Huang, C. Lawrence, H. Kim, S.W. Lee, N. Ghafouri, M. Kaviani, C. Uher and K. Najafi  
*University of Michigan, USA*
- WP **AL TO AL WAFER BONDING FOR MEMS ENCAPSULATION AND 3-D INTERCONNECT**  
C.H. Yun, J.R. Martin, E.B. Tarvin and J.T. Winbigler  
*Analog Devices Inc., USA*
- WP **MULTI-AXIAL SUPER-STRETCHABLE INTERCONNECTS WITH ACTIVE ELECTRONICS**  
H.-J. Kim and B. Ziaie  
*Purdue University, USA*
- WP **A PERFORATED PLATE STACKED SI/GLASS HEAT EXCHANGER WITH IN-SITU TEMPERATURE SENSING FOR JOULE-THOMSON COOLERS**  
W. Zhu<sup>1</sup>, M.J. White<sup>2</sup>, G.F. Nellis<sup>2</sup>, S.A. Klein<sup>2</sup> and Y.B. Gianchandani<sup>1</sup>  
<sup>1</sup>University of Michigan, Ann Arbor, USA and <sup>2</sup>University of Wisconsin, Madison, USA
- ThP **WAFER LEVEL ENCAPSULATION TECHNOLOGY FOR MEMS DEVICES USING AN HF-PERMEABLE PECVD SIOC CAPPING LAYER**  
G. Verheijden<sup>1</sup>, G. Koops<sup>1</sup>, K.L. Le Phan<sup>2</sup> and J.T.M. van Beek<sup>2</sup>  
<sup>1</sup>NXP Semiconductors, BELGIUM and <sup>2</sup>NXP Semiconductors, THE NETHERLANDS



- ThP **WAFER-LEVEL SANDWICHED PACKAGING FOR HIGH-YIELD FABRICATION OF HIGH-PERFORMANCE MEMS INERTIAL SENSORS**  
K. Zhang and X.X. Li  
*Shanghai Institute of Microsystem and Information Technology, CHINA*
- ThP **THREE DIMENSIONAL ARRANGEMENT OF SENSORS USING DEVELOPMENT**  
A. Nakai, K. Matsumoto and I. Shimoyama  
*The University of Tokyo, JAPAN*
- ThP **THERMAL SWITCHES BASED ON COPLANAR EWOD FOR SATELLITE THERMAL CONTROL**  
J. Gong, G.H. Cha, Y.S. Ju and C.J. Kim  
*University of California at Los Angeles, USA*

## PHYSICAL SENSORS & SYSTEMS

- MP **STUDY OF THE LOWER RESOLUTION LIMIT AND THE TEMPERATURE-DEPENDENT PERFORMANCE OF A SURFACE MICROMACHINED GYROSCOPE**  
A. Kulygin, C. Kirsch, U. Schmid and H. Seidel  
*Saarland University, GERMANY*
- MP **HIGH-ASPECT-RATIO VERTICAL SURFACE PROFILER USING SENSITIVE DISPLACEMENT DETECTION BY OPTOMECHANICAL PROBE**  
Y. Hamaguchi<sup>1</sup>, M. Kubota<sup>1</sup>, J.-B. Pourciel<sup>2</sup> and Y. Mita<sup>1</sup>  
<sup>1</sup>*The University of Tokyo, JAPAN* and <sup>2</sup>*LAAS-CNRS Université Paul Sabatier, FRANCE*
- MP **THE NANOGAP PIRANI — A PRESSURE SENSOR WITH SUPERIOR LINEARITY IN ATMOSPHERIC PRESSURE RANGE**  
K. Khosraviani and A.M. Leung  
*Simon Fraser University, CANADA*
- MP **AIR FLOW SENSOR FOR AN INSECT-LIKE FLAPPING WING**  
H. Takahashi, E. Iwase, K. Matsumoto and I. Shimoyama  
*The University of Tokyo, JAPAN*
- MP **DEVELOPMENT OF AIR-COUPLED ULTRASOUND TRANSDUCERS FOR NONDESTRUCTIVE EVALUATION**  
X. Wang<sup>1</sup>, Y. Fan<sup>1</sup>, W.-C. Tian<sup>1</sup>, H.-J. Kwon<sup>2</sup>, S. Kennerly<sup>1</sup>, G. Claydon<sup>1</sup> and A. May<sup>1</sup>  
<sup>1</sup>*GE Global Research Center, USA* and <sup>2</sup>*GE Sensing, USA*
- MP **A MICROMECHANICAL ELECTROMETER APPROACHING SINGLE-ELECTRON CHARGE RESOLUTION AT ROOM TEMPERATURE**  
J. Lee, Y. Zhu and A.A. Seshia  
*University of Cambridge, UK*
- TP **HIGH FREQUENCY XYZ-AXIS SINGLE-DISK SILICON GYROSCOPE**  
H. Johari, J.S. Shah and F. Ayazi  
*Georgia Institute of Technology, USA*
- TP **INHERENTLY ROBUST MICRO GYROSCOPE ACTUATED BY PARAMETRIC RESONANCE**  
L.A. Oropeza-Ramos, C.B. Burgner and K.L. Turner  
*University of California, Santa Barbara, USA*
- TP **MEMS CAPACITIVE FORCE SENSORS FOR MICRO-SCALE COMPRESSION TESTING OF BIOMATERIALS**  
K. Kim, J. Cheng, Q. Liu, X.Y. Wu and Y. Sun  
*University of Toronto, CANADA*
- TP **ORGANIC SEMICONDUCTOR BASED STRAIN SENSORS FOR INPUT SYSTEM ON FLEXIBLE OLEDs**  
M. Muraki, S. Takamatsu, K. Matsumoto and I. Shimoyama  
*The University of Tokyo, JAPAN*
- TP **HIGHLY SENSITIVE MICRO CORIOLIS MASS FLOW SENSOR**  
J. Haneveld, T.S.J. Lammerink, M.A. Dijkstra, H. Droogendijk, M.J. de Boer and R.J. Wiegerink  
*University of Twente, THE NETHERLANDS*
- TP **THREE-LAYER QUANTITATIVE EXTRACTION OF MOLECULE SELF-ASSEMBLY INDUCED SURFACE-STRESS BY CANTILEVER NANOMECHANICAL DETECTION**  
G. Zuo and X.X. Li  
*Shanghai Institute of Microsystem and Information Technology, CHINA*
- TP **A CHARGE CONVERSION NANOPARTICLE ENHANCED MICROGEIGER FOR ALPHA, BETA, GAMMA, AND NEUTRON DETECTION**  
C. Whitney and C. Wilson  
*Louisiana Tech University, USA*
- WP **A X-AXIS MICROMACHINED GYROSCOPE WITH DOUBLY DECOUPLED OSCILLATION MODES**  
X.S. Liu, Z.C. Yang, X.Z. Chi, J. Cui, H.T. Ding, Z.Y. Guo, B. Lv and G.Z. Yan  
*Peking University, CHINA*
- WP **TRI-AXIAL HIGH-G CMOS-MEMS CAPACITIVE ACCELEROMETER ARRAY**  
A.E. Wung<sup>1</sup>, R.V. Park<sup>2</sup>, K.J. Rebello<sup>2</sup> and G.K. Fedder<sup>1</sup>  
<sup>1</sup>*Carnegie Mellon University, USA* and <sup>2</sup>*Johns Hopkins University, USA*
- WP **HIGH TEMPERATURE HIGH ACCURACY PIEZORESISTIVE PRESSURE SENSOR BASED ON SMART-CUT SOI**  
S. Guo  
*Goodrich Corporation, USA*
- WP **POROUS NYLON WITH ELECTRO-ACTIVE DOPANTS AS FLEXIBLE SENSORS AND ACTUATORS**  
S.-L. Yu, D.-R. Chang, L.-C. Tsao, W.-P. Shih and P.-Z. Chang  
*National Taiwan University, TAIWAN*



- WP **MINIATURIZATION OF ON-WALL IN-TUBE FLEXIBLE THERMAL FLOW SENSOR USING HEAT SHRINKABLE TUBE**  
J. Naito, M. Shikida, M. Hirota, Z. Tan and K. Sato  
*Nagoya University, JAPAN*
- WP **THE MAGNETIC CALIBRATION AND OPTIMIZATION OF SYMMETRIC HALL SENSORS MAY BE ACCOMPLISHED EVEN IN THE ABSENCE OF A MAGNETIC FIELD**  
M. Cornils and O. Paul  
*University of Freiburg, GERMANY*
- ThP **A NOVEL OPTICAL LAMELLAR GRATING OUT-OF-PLANE MICROGYROSCOPE**  
G. Zhou, K.L. Cheo, Y. Du and F.S. Chau  
*National University of Singapore, SINGAPORE*
- ThP **MONOLITHICALLY FABRICATED POLYMERMEMS 3-AXIS THERMAL ACCELEROMETERS DESIGNED FOR AUTOMATED WIREBONDER ASSEMBLY**  
S.-H. Tsang, A.H. Ma, K.S. Karim, M. Parameswaran and A.M. Leung  
*Simon Fraser University, CANADA*
- ThP **AEROMEMS PRESSURE SENSOR ARRAY FEATURING THROUGH-WAFER VIAS FOR HIGH-RESOLUTION WALL PRESSURE MEASUREMENTS**  
A. Berns, H.-D. Ngo and E. Obermeier  
*Technical University of Berlin, GERMANY*
- ThP **A SLOW-ADAPTING MICROFLUIDIC BASED TACTILE SENSOR**  
W.Y. Tseng, J.S. Fisher, K.B. Rinaldi and A.P. Lee  
*University of California, Irvine, USA*
- ThP **THERMODYNAMIC ANALYSIS OF A NOVEL THERMOELECTRIC MICRO-DROPLET SENSOR**  
J. Ni, W. Benecke and W. Lang  
*Institute of Microsensors, -Actuators and -Systems, GERMANY*
- ThP **HIGHLY SENSITIVE RESONANT MAGNETIC MICROSENSOR WITH  $\mu$ T RESOLUTION**  
S. Brugger and O. Paul  
*University of Freiburg, GERMANY*

#### POWER MEMS & MICRO FUEL CELLS

- MP **MICROFABRICATION AND TEST OF AN INTEGRATED COLLOID THRUSTER**  
R. Krpoun, M. Raeber and H.R. Shea  
*Ecole Polytechnique Fédérale de Lausanne, SWITZERLAND*
- MP **MEMS FUEL CELL SYSTEM FOR PORTABLE POWER SOURCE: INTEGRATION OF METHANOL REFORMER, PROX, AND FUEL CELL**  
T. Kim and S. Kwon  
*Korea Advanced Institute of Science and Technology, KOREA*
- TP **VACUUM-PACKAGED MICRO FUEL REFORMER FOR HIGH THERMAL EFFICIENCY AND LOW PACKAGE TEMPERATURE**  
A. Kasuga, S. Tanaka and M. Esashi  
*Tohoku University, JAPAN*
- TP **PARYLENE HT BASED MICRO POWER GENERATORS**  
H. Lo and Y. Tai  
*California Institute of Technology, USA*
- WP **FUEL AND CO<sub>2</sub> SELF-EXCHANGE SYSTEM WITH MICRO FLUID CHANNELS FOR A MICRO DIRECT METANOL FUEL CELL**  
H. Uehara, S. Morishita, A. Kamitani, H. Onishi and H. Kotaki  
*Sharp Corporation, JAPAN*
- WP **A SILICON-BASED MICRO DIRECT METHANOL FUEL CELL WITH MICROBLOCKS IN ANODE STRUCTURE**  
Q. Zhang, X.H. Wang, L.Y. Zhong, Y.A. Zhou, X.P. Qiu and L.T. Liu  
*Tsinghua University, CHINA*
- WP **SELF-POWERED DISCHARGE-BASED WIRELESS TRANSMITTER**  
S. Tin<sup>1</sup>, R. Duggirala<sup>1</sup>, R. Polcawich<sup>2</sup>, M. Dubey<sup>2</sup> and A. Lal<sup>1</sup>  
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- ThP **MICROBATTERIES WITH TOBACCO MOSAIC VIRUS TEMPLATED ELECTRODES**  
K. Gerasopoulos, M. McCarthy, E. Royston, J. Culver and R. Ghodssi  
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- ThP **FABRICATION OF A FULLY INTEGRATED ELECTROSPRAY ARRAY WITH APPLICATIONS TO SPACE PROPULSION**  
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- ThP **MECHANICAL RECTIFIER FOR MICRO ELECTRIC GENERATORS**  
S. Nagasawa, T. Suzuki, Y. Takayama, K. Tsuji and H. Kuwano  
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#### RF MEMS & SWITCHES

- MP **SOLENOIDAL MICRO COILS MANUFACTURED WITH A WIRE BONDER**  
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*University of Freiburg, GERMANY*





- MP **LOW PHASE-NOISE UHF THIN-FILM PIEZOELECTRIC-ON-SUBSTRATE LBAR OSCILLATORS**  
H. Miri Lavasani, R. Abdolvand and F. Ayazi  
*Georgia Institute of Technology, USA*
- MP **INTERNAL ELECTRICAL PHASE INVERSION FOR FF-BEAM RESONATOR ARRAYS AND TUNING FORK FILTERS**  
J. Yan<sup>1</sup>, A.A. Seshia<sup>1</sup>, K.L. Phan<sup>2</sup> and J.T.M. van Beek<sup>2</sup>  
<sup>1</sup>*University of Cambridge, UK* and <sup>2</sup>*NXP Semiconductors, Philips Campus, THE NETHERLANDS*
- MP **PARAMETRICALLY AMPLIFIED MICROELECTROMECHANICAL MIXER**  
M. Koskenvuori and I. Tittonen  
*Helsinki University of Technology, FINLAND*
- TP **SUSPENDED NANOSCALE SOLENOID METAL INDUCTOR WITH TENS-NH LEVEL INDUCTANCE**  
X.H. Lai, F. Ding, Z.G. Xu, W.G. Wu, J. Xu and Y.L. Hao  
*Peking University, CHINA*
- TP **CHARACTERIZATION OF IN-IC INTEGRABLE IN-PLANE NANOMETER SCALE RESONATORS FABRICATED BY A SILICON ON NOTHING ADVANCED CMOS TECHNOLOGY**  
C. Durand<sup>1</sup>, F. Casset<sup>2</sup>, B. Legrand<sup>3</sup>, M. Faucher<sup>3</sup>, P. Renaux<sup>2</sup>, D. Mercier<sup>2</sup>, D. Renaud<sup>2</sup>, D. Dutartre<sup>1</sup>, E. Ollier<sup>2</sup>, P. Ancy<sup>1</sup> and L. Buchailot<sup>3</sup>  
<sup>1</sup>*STMicroelectronics, FRANCE*, <sup>2</sup>*CEA-LETI MINATEC, FRANCE* and <sup>3</sup>*IEMN CNRS, FRANCE*
- TP **SMALL-BANDWIDTH INTEGRATED TUNABLE BANDPASS FILTERS FOR GSM APPLICATIONS**  
M. Rais-Zadeh, H.M. Lavasani and F. Ayazi  
*Georgia Institute of Technology, USA*
- WP **FLIP-CHIP BONDED MEMS CAPACITOR**  
Y.J. Chen<sup>1</sup>, C.K. Kao<sup>2</sup>, W.P. Shih<sup>1</sup>, S.Y. Chung<sup>1</sup> and P.Z. Chang<sup>1</sup>  
<sup>1</sup>*National Taiwan University, TAIWAN* and <sup>2</sup>*Chung-Shan Institute of Science and Technology, TAIWAN*
- WP **DIGITALLY-TUNABLE MEMS FILTER USING MECHANICALLY-COUPLED RESONATOR ARRAY**  
H. Chandralalim and S. Bhave  
*Cornell University, USA*
- WP **SINGLE POLE FOUR THROW RF MEMS SWITCH WITH DOUBLE STOP COMB DRIVE**  
S.C. Kang, H.C. Kim and K.J. Chun  
*Seoul National University, KOREA*
- ThP **SURFACE MICROMACHINED GHZ TUNABLE CAPACITOR WITH 14:1 CONTINUOUS TUNING RANGE**  
C.-Y. Lee, S.-J. Chen, D. Chi, H. Yu and E.S. Kim  
*University of Southern California, USA*
- ThP **MECHANICAL PHASE INVERSION FOR COUPLED LAMÉ MODE RESONATOR ARRAY FILTERS**  
J. Yan<sup>1</sup>, A.A. Seshia<sup>1</sup>, K.L. Phan<sup>2</sup> and J.T.M. van Beek<sup>2</sup>  
<sup>1</sup>*University of Cambridge, UK* and <sup>2</sup>*NXP Semiconductors, Philips Campus, THE NETHERLANDS*
- ThP **2.45 GHZ SAW-BASED PASSIVE BINARY TRANSPONDER FOR WIRELESS INTERFACES OF INTEGRATED SENSORS**  
J.H. Kuypers, S. Tanaka and M. Esashi  
*Tohoku University, JAPAN*

## SELF-ASSEMBLY METHODS

- MP **PART TILTING IN CAPILLARY-BASED SELF-ASSEMBLY: MODELING AND CORRECTION METHODS**  
S.H. Abbasi<sup>1</sup>, A.X. Zhou<sup>1</sup>, R. Baskaran<sup>1,2</sup> and K.F. Böhringer<sup>1</sup>  
<sup>1</sup>*University of Washington, USA* and <sup>2</sup>*Intel Corporation, USA*
- MP **A FULLY DRY SELF-ASSEMBLY PROCESS WITH PROPER IN-PLANE ORIENTATION**  
S. Park and K.F. Böhringer  
*University of Washington, USA*
- TP **GOLD NANOPARTICLE PATTERNING BY SELF-ASSEMBLY AND TRANSFER FOR LSPR BASED SENSING**  
T. Ozaki, K. Sugano, T. Tsuchiya and O. Tabata  
*Kyoto University, JAPAN*
- TP **CASCADED MECHANICAL ALIGNMENT FOR ASSEMBLING 3D MEMS**  
N. Shaar, G. Barbastathis and C. Livermore  
*Massachusetts Institute of Technology, USA*
- WP **DNA MEDIATED SEQUENTIAL SELF-ASSEMBLY OF NANO/MICRO COMPONENTS**  
T.K. Kusakabe, T.T. Tanemura, Y.H. Higuchi, K.S. Sugano, T.T. Tshuchiya and O.T. Tabata  
*Kyoto University, JAPAN*
- WP **CATALYST ENHANCED MICRO SCALE BATCH ASSEMBLY**  
R. Baskaran, J. Hoo, B. Cheng and K. Böhringer  
*University of Washington, USA*
- ThP **CONTACT POTENTIAL DIFFERENCE FOR SEQUENTIAL ASSEMBLY AND FACE ALIGNMENT OF SUBMILLIMETER COMPONENTS**  
T. Tanemura, Y. Higuchi, T. Kusakabe, K. Sugano, T. Tsuchiya and O. Tabata  
*Kyoto University, JAPAN*
- ThP **INTERFACING METHODS FOR FLUIDICALLY-ASSEMBLED MICROCOMPONENTS**  
M.T. Tolley, A. Baisch, M. Krishnan, D. Erickson and H. Lipson  
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