

# MEMS 2011 PROGRAM SCHEDULE

**Sunday, January 23, 2010**

18:00 - **Registration**  
21:00

18:30 - **Welcome Reception**  
20:30

**Monday, January 24, 2011**

08:00 **Welcome Address**  
K. Böhringer, *University of Washington, USA*  
L. Lin, *University of California, Berkeley, USA*

## PLENARY SPEAKER I

Session Chairs:  
K. Böhringer, *University of Washington, USA*  
L. Lin, *University of California, Berkeley, USA*

08:20 **3D PHOTONIC METAMATERIALS AND INVISIBILITY CLOAKS: THE MAKING OF**  
M. Wegener  
*Karlsruhe Institute of Technology, GERMANY*

## SESSION I - OPTICAL MEMS

Session Chairs:  
J. Kim, *Yonsei University, SOUTH KOREA*  
H. Zappe, *University of Freiburg – IMTEK, GERMANY*

09:00 **AN OPTOFLUIDIC PRISM WITH LARGE DEVIATION ANGLE BY TWO FLOW STREAMS**  
S. Xiong<sup>1</sup>, L.K. Chin<sup>1</sup>, Y. Yang<sup>1</sup>, Y.H. Fu<sup>1</sup>, Y. Chen<sup>2</sup>, and A.Q. Liu<sup>1</sup>  
<sup>1</sup>*Nanyang Technological University, SINGAPORE* and  
<sup>2</sup>*Agency for Science, Technology and Research (A\*STAR), SINGAPORE*

09:20 **MECHANO-OPTICAL SWITCHING IN A MEMS INTEGRATED PHOTONIC CRYSTAL SLAB WAVEGUIDE**  
S.M.C. Abdulla, L.J. Kauppinen, M. Dijkstra, E. Berenschot, M.J. De Boer, R.M. de Ridder, and G.J.M. Krijnen  
*University of Twente, THE NETHERLANDS*

09:40 **ULTRA-HIGH COUPLING EFFICIENCY OF MEMS TUNABLE LASER VIA 3-DIMENSIONAL MICRO-OPTICAL COUPLING SYSTEM**  
J.F. Tao<sup>1,2</sup>, A.B. Yu<sup>3</sup>, H. Cai<sup>3</sup>, W.M. Zhu<sup>1</sup>, Q.X. Zhang<sup>3</sup>, J. Wu<sup>2</sup>, K. Xu<sup>2</sup>, J.T. Lin<sup>2</sup>, and A. Q. Liu<sup>1</sup>  
<sup>1</sup>*Nanyang Technological University, SINGAPORE*,  
<sup>2</sup>*Beijing University of Posts and Telecommunications, CHINA*, and  
<sup>3</sup>*Institute of Microelectronics, SINGAPORE*

10:00 **Break & Exhibit Inspection**

## SESSION II - MEDICAL MEMS

Session Chairs:

T. Tsuchiya, *Kyoto University, JAPAN*

D. Young, *University of Utah, USA*

- 10:30 **PNEUMATICALLY DEPLOYED NET SYSTEM FOR ENDOSCOPIC REMOVAL OF FOREIGN OBJECT**  
W. Choi<sup>1</sup>, V. Rubtsov<sup>2</sup>, and C.-J. Kim<sup>1</sup>  
<sup>1</sup>*University of California, Los Angeles, USA* and <sup>2</sup>*Intelligent Optical Systems, Inc. (IOS), USA*
- 10:50 **AN ACTIVE TISSUE-CONTRAST SENSING MICROSYSTEM FOR BIOPSY NEEDLES: INITIAL RESULTS**  
T. Li and Y.B. Gianchandani  
*University of Michigan, USA*
- 11:10 **A DUAL MICROSCALE GLUCOSE SENSOR ON A CONTACT LENS, TESTED IN CONDITIONS MIMICKING THE EYE**  
H. Yao, A. Afanasiev, I. Lähdesmäki, and B.A. Parviz  
*University of Washington, USA*
- 11:30 **MULTIFUNCTIONAL OPTICALLY DRIVEN MICROROBOT FOR REALTIME 3D BIO-MANIPULATION AND IMAGING**  
M. Ikeuchi<sup>1,2</sup>, K. Isozaki<sup>3</sup>, K. Kyue<sup>3</sup>, H. Sunabe<sup>3</sup>, N. Shimada<sup>3</sup>, H. Sasago<sup>4</sup>, and K. Ikuta<sup>1</sup>  
<sup>1</sup>*University of Tokyo, JAPAN*, <sup>2</sup>*Japan Science and Technology Agency (JST), JAPAN*, <sup>3</sup>*Nagoya University, JAPAN*, <sup>4</sup>*Sasago Inc., JAPAN*
- 11:50 **A 2.8-MM IMAGING PROBE BASED ON A HIGH-FILL-FACTOR MEMS MIRROR AND WIRE-BONDING-FREE PACKAGING FOR ENDOSCOPIC OPTICAL COHERENCE TOMOGRAPHY**  
L. Wu<sup>1,2</sup>, S.R. Samuelson<sup>2</sup>, J. Sun<sup>2</sup>, W. Lau<sup>1,2</sup>, S. Choe<sup>2</sup>, B.S. Sorg<sup>2</sup>, K. Jia<sup>2</sup>, and H. Xie<sup>1,2</sup>  
<sup>1</sup>*WiOptix, Inc., USA* and <sup>2</sup>*University of Florida, USA*
- 12:10 **Lunch & Exhibit Inspection**
- 13:10 **Poster/Oral Session I**  
Session Chairs:  
F. Laermer, *Robert Bosch GmbH, GERMANY*  
M. Wong, *Hong Kong University of Science and Technology, HONG KONG*

## SESSION III - 3D FABRICATION & ASSEMBLY

Session Chairs:

R. Baskaran, *Intel Corporation, USA*

J. Oberhammer, *KTH - Royal Institute of Technology, SWEDEN*

- 15:10 **FABRICATION OF HIGH ASPECT RATIO THROUGH SILICON VIAS (TSVs) BY MAGNETIC ASSEMBLY OF NICKEL WIRES**  
A.C. Fischer, N. Roxhed, T. Haraldsson, N. Heinig, G. Stemme, and F. Niklaus  
*Royal Institute of Technology (KTH), SWEDEN*
- 15:30 **SELECTIVE SELF-ASSEMBLY OF NANOPARTICLES ON TRENCH SIDEWALLS AND ITS RELATIONSHIP WITH SCALLOP NANOSTRUCTURE**  
M. Abasaki<sup>1,2</sup>, S. Souma<sup>2</sup>, M. Takeda<sup>1</sup>, N. Moronuki<sup>1,3</sup>, and M. Sugiyama<sup>1,4</sup>  
<sup>1</sup>*BEANS (Bio Electromechanical Autonomous Nano Systems), JAPAN,*  
<sup>2</sup>*Fuji Electric Systems, Co., Ltd, JAPAN,* <sup>3</sup>*Tokyo Metropolitan University, JAPAN,* and  
<sup>4</sup>*University of Tokyo, JAPAN*
- 15:50 **3D-SOULE: A FABRICATION PROCESS FOR LARGE SCALE INTEGRATION AND MICROMACHINING OF SPHERICAL STRUCTURES**  
K. Visvanathan, T. Li, Y.B. Gianchandani  
*University of Michigan, USA*
- 16:10 **LOW TEMPERATURE CONFORMAL SILICON DIOXIDE DEPOSITION USING SUPERCRITICAL FLUID FOR POLYMER-BASED MEMS**  
H. Yamada<sup>1</sup>, T. Momose<sup>1,2</sup>, Y. Kitamura<sup>3</sup>, Y. Hattori<sup>3</sup>, Y. Shimogaki<sup>1,2</sup>, and M. Sugiyama<sup>1,2</sup>  
<sup>1</sup>*BEANS (Bio Electromechanical Autonomous Nano Systems), JAPAN,* <sup>2</sup>*University of Tokyo, JAPAN,* and  
<sup>3</sup>*DENSO Corporation, JAPAN*
- 16:30 **OPTOELECTRONIC RECONFIGURABLE MICROCHANNELS**  
G. Haulot, A.J. Benahmed, and C.M. Ho  
*University of California, Los Angeles, USA*
- 16:50 **Adjourn for the Day**

**Tuesday, January 25, 2011**

**PLENARY SPEAKER II**

Session Chairs:

K. Böhringer, *University of Washington, USA*

L. Lin, *University of California, Berkeley, USA*

08:00 **VIDEO IMAGING OF BIOMOLECULAR PROCESSES BY HIGH-SPEED AFM**

T. Ando

*Kanazawa University, JAPAN*

**SESSION IV - DIAGNOSTICS & LAB-ON-A-CHIP**

Session Chairs:

J. Duce, *Dublin City University, IRELAND*

M. Seki, *Chiba University, JAPAN*

08:40 **OPEN-ACCESS PHOTOTRANSISTOR-BASED OPTOELECTRONIC TWEEZERS FOR LONG-TERM SINGLE CELL HETEROGENEITY STUDY**

H.-Y. Hsu, A. Jamshidi, S. Shekarchian, W. Lam, J.K. Valley, S.N. Pei, and M.C. Wu

*University of California, Berkeley, USA*

09:00 **INTEGRATED MEMS PLATFORM WITH SILICON NANOTWEZERS AND OPEN MICROFLUIDIC DEVICE FOR MOLECULAR AND CELLULAR BIOMECHANICAL ASSAYS**

M. Kumemura<sup>1</sup>, D. Collard<sup>1</sup>, R. Tourvielle<sup>2</sup>, N. Lafitte<sup>1</sup>, K. Montagne<sup>1</sup>, S. Yoshizawa<sup>3</sup>, D. Fourmy<sup>3</sup>, C. Yamahata<sup>2</sup>, L. Jalabert<sup>1</sup>, Y. Sakai<sup>1</sup>, S. Takeuchi<sup>1</sup>, T. Fujii<sup>1</sup>, and H. Fujita<sup>1</sup>

<sup>1</sup>*University of Tokyo, JAPAN*, <sup>2</sup>*École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND*, and <sup>3</sup>*CNRS-CGM, FRANCE*

09:20 **PAIRING SINGLE ADHERENT CELLS IN THE DYNAMIC MICROARRAY**

T. Teshima<sup>1</sup>, H. Onoe<sup>1,2</sup>, K. Kuribayashi-Shigetomi<sup>1,2</sup>, and S. Takeuchi<sup>1,2</sup>

<sup>1</sup>*University of Tokyo, JAPAN* and <sup>2</sup>*Japan Science and Technology Agency (JST)*

09:40 **A PORTABLE MICROFLUIDIC PAPER-BASED DEVICE FOR ELISA**

X.Y. Liu, C.M. Cheng, A.W. Martinez, K.A. Mirica, X.J. Li, S.T. Phillips, M. Mascareñas, and G.M. Whitesides

*Harvard University, USA*

10:00 **Break & Exhibit Inspection**

## SESSION V - NEMS/CNTE

Session Chairs:

W. King, *University of Illinois Urbana-Champaign, USA*

X. Li, *Chinese Academy of Sciences, CHINA*

- 10:30 **A SHIELDED CANTILEVER-TIP MICROWAVE PROBE FOR MICRO/NANO SURFACE IMAGING OF CONDUCTIVE PROPERTIES**  
Y.L. Yang<sup>1</sup>, K. Lai<sup>2</sup>, Q.C. Tang<sup>1</sup>, W. Kundhikanjana<sup>2</sup>, M. Kelly<sup>2</sup>, Z.X. Shen<sup>2</sup>, and X. Li<sup>1</sup>  
<sup>1</sup>*Chinese Academy of Sciences, CHINA* and <sup>2</sup>*Stanford University, USA*
- 10:50 **PLATFORM FOR STRAINABLE, TEM-COMPATIBLE, MEMS-EMBEDDED CARBON NANOTUBE TRANSISTORS**  
M. Muoth, S.-W. Lee, and C. Hierold  
*ETH Zurich, SWITZERLAND*
- 11:10 **MICROSWITCH WITH SELF-ASSEMBLED CARBON NANOTUBE ARRAYS FOR HIGH CURRENT DENSITY AND RELIABLE CONTACT**  
J. Choi, J.-I. Lee, Y. Eun, M.-O. Kim, and J. Kim  
*Yonsei University, SOUTH KOREA*
- 11:30 **MONOLITHICALLY INTEGRATED JUNCTION FETS AND NEMS**  
K. Amponsah and A. Lal  
*Cornell University, USA*
- 11:50 **A SINGLE LITHOGRAPHY VERTICAL NEMS SWITCH**  
J. Rubin, R. Sundararaman, M.K. Kim, and S. Tiwari  
*Cornell University, USA*
- 12:10 **MEMS 2012 Announcement**
- 12:20 **Lunch & Exhibit Inspection**
- 13:20 **Poster/Oral Session II**  
Session Chairs:  
F. Ayazi, *Georgia Tech, USA*  
Y. Suzuki, *University of Tokyo, JAPAN*

## SESSION VI - MEMS ON FLEXIBLE SUBSTRATE

Session Chairs:

G. Krijnen, *University of Twente, THE NETHERLANDS*

S. Sedky, *American University, Cairo, EGYPT*

- 15:20 **DIRECT PHYSICAL EXFOLIATION AND TRANSFER OF GRAPHENE GROWN VIA ETHANOL CHEMICAL VAPOR DEPOSITION**  
K. Yoo, Y. Takei, B. Hou, S. Chiashi, S. Maruyama, K. Matsumoto, and I. Shimoyama  
*University of Tokyo, JAPAN*
- 15:40 **UNIFORMLY-SIZED GIANT LIPOSOME FORMATION WITH GENTLE HYDRATION**  
T. Osaki<sup>1</sup>, K. Kuribayashi-Shigetomi<sup>2</sup>, R. Kawano<sup>1</sup>, H. Sasaki<sup>1</sup>, and S. Takeuchi<sup>1,2</sup>  
<sup>1</sup>*Kanagawa Academy of Science and Technology (KAST), JAPAN* and <sup>2</sup>*University of Tokyo, JAPAN*
- 16:00 **NANOPOROUS ANODIC ALUMINUM OXIDE (NP-AAO) ALIGNMENT LAYER ON PET/ITO SUBSTRATE FOR FLEXIBLE LIQUID CRYSTAL DISPLAY APPLICATION**  
C. Hong<sup>1</sup>, T.T. Tang<sup>2</sup>, R.P. Pan<sup>2</sup>, and W. Fang<sup>1</sup>  
<sup>1</sup>*National Tsing Hua University, TAIWAN* and <sup>2</sup>*National Chiao Tung University, TAIWAN*
- 16:20 **POROUS PARYLENE AND EFFECTS OF LIQUID ON PARYLENE FILMS DEPOSITED ON LIQUID**  
N. Binh-Khiem, K. Matsumoto, and I. Shimoyama  
*University of Tokyo, JAPAN*
- 16:40 **Adjourn for the Day**

**Wednesday, January 26, 2011**

**PLENARY SPEAKER III**

Session Chairs:

K. Böhringer, *University of Washington, USA*  
L. Lin, *University of California, Berkeley, USA*

08:00 **NANOGENERATORS FOR SELF-POWERING NANOSYSTEMS AND  
PIEZOTRONICS FOR SMART MEMS/NEMS**

Z.L. Wang

*Georgia Institute of Technology, USA*

**SESSION VII - POWER & PIEZOS**

Session Chairs:

A. Holmes, *Imperial College London, UK*  
S. Tanaka, *Tohoku University, JAPAN*

08:40 **A COMPLETE POWER SOURCE OF MICRO PEM FUEL CELL WITH  
NABH<sub>4</sub> MICROREACTOR**

T. Kim<sup>1</sup> and J. Lee<sup>2</sup>

<sup>1</sup>*Chosun University, SOUTH KOREA* and <sup>2</sup>*Samsung Electronics, SOUTH KOREA*

09:00 **MEMS-BASED THICK FILM PZT VIBRATIONAL ENERGY HARVESTER**

A. Lei<sup>1</sup>, R. Xu<sup>1</sup>, A. Thyssen<sup>1</sup>, A.C. Stoot<sup>1</sup>, T.L. Christiansen<sup>1</sup>, K. Hansen<sup>2</sup>, R. Lou-Møller<sup>2</sup>,  
E.V. Thomsen<sup>1</sup>, and K. Birkelund<sup>1</sup>

<sup>1</sup>*Technical University of Denmark, DENMARK* and <sup>2</sup>*Meggitt A/S, DENMARK*

09:20 **TEMPERATURE SENSITIVE MICROWIRE ARRAYS FOR ARTIFICIAL  
WHISKER ELECTRONICS**

A. Ikedo, M. Ishida, and T. Kawano

*Toyohashi University of Technology, JAPAN*

09:40 **PAPER-BASED PIEZORESISTIVE MEMS FORCE SENSORS**

X.Y. Liu, M. O'Brien, M. Mwangi, X.J. Li, and G.M. Whitesides

*Harvard University, USA*

10:00 **Break & Exhibit Inspection**

## SESSION VIII - NOVEL ACTUATION

Session Chairs:

J. Brugger, *Ecole Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND*

K. Takahata, *University of British Columbia, CANADA*

- 10:30 **INTEGRATED ALL-ELECTRIC HIGH ENERGY ION BEAM GUIDANCE ON CHIP: TOWARDS MINIATURE PARTICLE ACCELERATOR**  
Y. Shi and A. Lal  
*Cornell University, USA*
- 10:50 **POLYMER MEMBRANE-BASED THERMO-PNEUMATIC ACTUATION FOR DISTRIBUTED AIR-JET PLANAR MICROMANIPULATOR**  
Y.-A. Chapuis<sup>1,2</sup>, L. Jalabert<sup>1</sup>, E. Sarajlic<sup>1</sup>, R. Vermeer<sup>3</sup>, D. Collard<sup>1</sup>, and H. Fujita<sup>1</sup>  
<sup>1</sup>*University of Tokyo, JAPAN*, <sup>2</sup>*University of Strasbourg, FRANCE*, and  
<sup>3</sup>*MESA+, University of Twente, THE NETHERLANDS*
- 11:10 **LONG-TERM AND ROOM TEMPERATURE OPERABLE BIO-MICROBOT POWERED BY INSECT HEART TISSUE**  
Y. Akiyama, K. Odaira, K. Iwabuchi, and K. Morishima  
*Tokyo University of Agriculture and Technology, JAPAN*
- 11:30 **A LIGHT-REGULATED BIO-MICRO-ACTUATOR POWERED BY TRANSGENIC *DROSOPHILA MELANOGASTER* MUSCLE TISSUE**  
K. Suzumura, K. Funakoshi, T. Hoshino, H. Tsujimura, K. Iwabuchi, Y. Akiyama, and K. Morishima  
*Tokyo University of Agriculture and Technology, JAPAN*
- 11:50 **ADVANCED EWOD-BASED DIGITAL MICROFLUIDIC SYSTEM FOR MULTIPLEXED ANALYSIS OF BIOMOLECULAR INTERACTIONS**  
D. Brassard, L. Malic, C. Miville-Godin, F. Normandin, and T. Veres  
*National Research Council, CANADA*
- 12:10 **Lunch & Exhibit Inspection**
- 13:10 **Poster/Oral Session III**  
Session Chairs:  
C.-J. Kim, *University of California, Los Angeles, USA*  
H. Zappe, *University of Freiburg - IMTEK, GERMANY*



## SESSION IX - RF MEMS & RESONATORS

Session Chairs:

C.-W. Baek, *Chung-Ang University, SOUTH KOREA*

G. Piazza, *University of Pennsylvania, USA*

- 15:10 **SUSPENDED NANOCANNEL IN MEMS PLATE RESONATOR FOR MASS SENSING IN LIQUID**  
V. Agache, G. Blanco-Gomez, M. Cochet, and P. Caillat  
*CEA-LETI/Minatec, FRANCE*
- 15:30 **FOUCAULT PENDULUM ON A CHIP: ANGLE MEASURING SILICON MEMS GYROSCOPE**  
I.P. Prikhodko, S.A. Zotov, A.A. Trusov, and A.M. Shkel  
*University of California, Irvine, USA*
- 15:50 **MULTI-POSITION LARGE TUNING-RANGE DIGITALLY TUNEABLE CAPACITORS EMBEDDED IN 3D MICROMACHINED TRANSMISSION LINES**  
U. Shah, M. Sterner, G. Stemme, and J. Oberhammer  
*Royal Institute of Technology (KTH), SWEDEN*
- 16:10 **COMBINED CAPACITIVE AND PIEZOELECTRIC TRANSDUCTION FOR HIGH PERFORMANCE SILICON MICRORESONATORS**  
A.K. Samarao and F. Ayazi  
*Georgia Institute of Technology, USA*
- 16:30 **CAPACITIVE-PIEZOELECTRIC AIN RESONATORS WITH  $Q > 12,000$**   
L.-W. Hung and C.T.-C. Nguyen  
*University of California, Berkeley, USA*
- 16:50 **SWITCH-LESS DUAL-FREQUENCY RECONFIGURABLE CMOS OSCILLATOR USING ONE SINGLE PIEZOELECTRIC ALN MEMS RESONATOR WITH CO-EXISTING S<sub>0</sub> AND S<sub>1</sub> LAMB-WAVE MODES**  
C. Zuo, J. Van der Spiegel, and G. Piazza  
*University of Pennsylvania, USA*
- 17:10 **Adjourn for the Day**

## Thursday, January 27, 2011

### 08:00 **Poster/Oral Session IV**

Session Chairs:

L. Buchaillet, *IEMN, FRANCE*

G.-B. Lee, *National Cheng Kung University, TAIWAN*

### 10:00 **Break & Exhibit Inspection**

#### **SESSION X - CELLS & MOLECULES**

Session Chairs:

E. Meng, *University of Southern California, USA*

F.-G. Tseng, *National Tsing Hua University, TAIWAN*

### 10:30 **GENE DELIVERY IN MICE USING AN IMPLANTED PNEUMATICALLY-ACTUATED MICROSYSTEM**

K. Shimizu<sup>1,2</sup>, Y. Mori<sup>2</sup>, K. Hayashi<sup>1</sup>, A. Shunori<sup>2</sup>, S. Kawakami<sup>1</sup>, M. Hashida<sup>1</sup>, and S. Konishi<sup>1,2</sup>

<sup>1</sup>Kyoto University, JAPAN and <sup>2</sup>Ritsumeikan University, JAPAN

### 10:50 **AN INTEGRATED MICROFLUIDIC SYSTEM FOR RAPID SCREENING OF ALFA-FETOPROTEIN APTAMERS**

C.-J. Huang, H.-I. Lin, S.-C. Shiesh, and G.-B. Lee

*National Cheng Kung University, TAIWAN*

### 11:10 **ON-CHIP DUAL-ARM MICROROBOT DRIVEN BY PERMANENT MAGNETS FOR HIGH SPEED CELL ENUCLEATION**

M. Hagiwara<sup>1</sup>, T. Kawahara<sup>1</sup>, L. Feng<sup>2</sup>, Y. Yamanishi<sup>3</sup>, and F. Arai<sup>1</sup>

<sup>1</sup>Nagoya University, JAPAN, <sup>2</sup>Tohoku University, JAPAN, and

<sup>3</sup>Japan Science and Technology Agency (JST), JAPAN

### 11:30 **A NEW MICROFLUID SYSTEM FOR MITOCHONDRIAL DNA EXTRACTION AND ANALYSIS**

C.-M. Chang, L.-F. Chiou, C.-C. Lin, D.-B. Shieh, and G.-B. Lee

*National Cheng Kung University, TAIWAN*

### 11:50 **MICROFLUIDIC WESTERN BLOTTING: CATIONIC SURFACTANT BASED PROTEIN SIZING INTEGRATED WITH ELECTROSTATIC IMMOBILIZATION**

D. Kim<sup>1</sup>, S.Q. Tia<sup>2</sup>, M. He<sup>1</sup>, and A.E. Herr<sup>1,2</sup>

<sup>1</sup>University of California, Berkeley, USA and <sup>2</sup>University of California, San Francisco, USA

### 12:10 **Conference Adjourns**

## POSTER/ORAL PRESENTATIONS

**M – Monday, 13:10 – 16:10**

**T – Tuesday, 13:10 – 16:10**

**W – Wednesday, 13:10 – 15:10**

**Th – Thursday, 08:00 – 10:00**

### FABRICATION TECHNOLOGIES

- 1-M A MUSHROOM-SHAPED CONVEX POLY-SI STRUCTURE FOR PREVENTING Z-DIRECTIONAL STICTION OF AN SOI-MEMS DEVICE**  
T. Akashi, H. Funabashi, and Y. Nonomura  
*Toyota Central R&D Labs., Inc., JAPAN*
- 2-T A SIMPLE METHOD FOR EFFECTIVELY RESTRAINING ELECTROCHEMICAL CORROSION OF POLYCRYSTALLINE SILICON BY HF-BASED SOLUTIONS**  
J. Xie<sup>1,2</sup>, Y.F. Liu<sup>1,2</sup>, M.L. Zhang<sup>1</sup>, J.L. Yang<sup>1,2</sup>, and F.H. Yang<sup>1</sup>  
<sup>1</sup>*Chinese Academy of Sciences, CHINA* and <sup>2</sup>*State Key Laboratory of Transducer Technology, CHINA*
- 3-W ASSEMBLING TECHNIQUE OF THREE DIMENSIONAL MICROSTRUCTURES USING CLIP MECHANISM OF MICROSPRING**  
K. Kotani, Y. Kawai, C.-Y. Shao, and T. Ono  
*Tohoku University, JAPAN*
- 4-Th CHARACTERIZATION OF KMPR<sup>®</sup>1025 AS A MASKING LAYER FOR DEEP REACTIVE ION ETCHING OF FUSED SILICA**  
T. Ray, H. Zhu, I.S. Elango, and D.R. Meldrum  
*Arizona State University, USA*
- 5-M CRYSTAL ORIENTATION DEPENDENT ETCHING IN RIE AND ITS APPLICATION**  
S. Tanaka<sup>1</sup>, K. Sonoda<sup>1,2</sup>, K. Kasai<sup>2</sup>, K. Kanda<sup>1,2</sup>, T. Fujita<sup>1,2</sup>, K. Higuchi<sup>2</sup>, and K. Maenaka<sup>1,2</sup>  
<sup>1</sup>*University of Hyogo, JAPAN* and <sup>2</sup>*Japan Science and Technology Agency (JST), JAPAN*
- 6-T CRYSTALLINE ANISOTROPIC DRY ETCHING FOR SINGLE CRYSTAL SILICON**  
T. Mishima, K. Terao, H. Takao, F. Shimokawa, F. Oohira, and T. Suzuki  
*Kagawa University, JAPAN*
- 7-W CURVED SU-8 STRUCTURE FABRICATION BASED ON THE ACID-DIFFUSION EFFECT**  
Q. Chen, G. Li, and J. Zhao  
*Chinese Academy of Sciences, CHINA*
- 8-Th DESIGN AND IMPLEMENTATION OF A MINIATURE POLYMER BALL BEARING SLIDE TABLE**  
C.-C. Lee, W.-H. Hsiao, and W. Fang  
*National Tsing Hua University, TAIWAN*
- 9-M DIRECT IMMOBILIZATION OF ENZYMES ON COMMON PHOTORESISTS**  
N. Thomas, I. Lähdesmäki, and B. Parviz  
*University of Washington, USA*
- 10-T DRY ETCHING OF SINGLE CRYSTAL PMN-PT PIEZOELECTRIC MATERIAL**  
J. Agnus, I.A. Ivan, and S. Queste  
*FEMTO-ST, FRANCE*
- 11-W ELECTRON BEAM DIRECT DRAWING ON LIVING CELL**  
T. Hoshino and K. Morishima  
*Tokyo University of Agriculture and Technology, JAPAN*

- 12-Th ENHANCED GOLD SERS SIGNALS ON HSR SURFACE EXTRUSIONS GENERATED ON CARBOXYL-RICH POLYSTYRENE BEADS**  
H.-Y. Hsieh<sup>1</sup>, P.-C. Wang<sup>1</sup>, J.-L. Xiao<sup>2,3</sup>, C.-H. Lee<sup>2,3</sup>, and F.-G. Tseng<sup>1,2</sup>  
<sup>1</sup>National Tsing Hua University, TAIWAN, <sup>2</sup>Academia Sinica, TAIWAN, and <sup>3</sup>National Yang-Ming University, TAIWAN
- 13-M FABRICATION AND CHARACTERIZATION OF HIGH CURRENT FIELD EMITTERS WITH SILICON BALL-TIP PINS**  
B.H. Kim, J.W. Kwon, E.A. Baxter, and S.D. Kovaleski  
*University of Missouri, USA*
- 14-T FABRICATION AND PROPERTIES OF 3D FLEXIBLE PARYLENE-BASED MICROELECTRODE ARRAY WITH SILICON TIPS**  
R. Wang, W. Zhao, W. Wang, and Z. Li  
*Peking University, CHINA*
- 15-W FABRICATION OF NANOPOROUS MEMBRANE AND ITS NON LITHOGRAPHIC PATTERNING USING ELECTROSPINNING AND STAMP-THRU-MOLD (ESTM)**  
P.F. Jao<sup>1</sup>, M. Machado<sup>2</sup>, X. Cheng<sup>1</sup>, D.E. Senior<sup>1</sup>, G.J. Kim<sup>1</sup>, D. Ding<sup>2</sup>, W. Sun<sup>2</sup>, and Y.-K. Yoon<sup>1,2</sup>  
<sup>1</sup>University of Florida, USA and <sup>2</sup>University at Buffalo, USA
- 16-Th FABRICATION OF SINGLE-CRYSTAL SILICON CARBIDE MEMS/NEMS FOR BIO-SENSING AND HARSH ENVIRONMENTS**  
F. Zhao and M.M. Islam  
*University of South Carolina, USA*
- 17-M GROWING A PATTERNED ARRAY OF DOUBLE-ANCHORED ELASTOMERIC MICROWIRES USING LOST-WAX CASTING**  
J. Lee and J. Kim  
*Iowa State University, USA*
- 18-T HETEROGENEOUS INTEGRATION TECHNOLOGY FOR COMBINATION OF DIFFERENT WAFER SIZES USING AN EXPANDABLE HANDLE SUBSTRATE**  
F. Forsberg, N. Roxhed, G. Stemme, and F. Niklaus  
*Royal Institute of Technology (KTH), SWEDEN*
- 19-W HIGH-ASPECT-RATIO, 3-D MICROMACHINING OF CARBON-NANOTUBE FORESTS BY MICRO-ELECTRO-DISCHARGE MACHINING IN AIR**  
M. Dahmardeh<sup>1</sup>, W. Khalid<sup>2</sup>, M.S. Mohamed Ali<sup>1,3</sup>, Y. Choi<sup>1,4</sup>, P. Yaghoobi<sup>1</sup>, A. Nojeh<sup>1</sup>, and K. Takahata<sup>1</sup>  
<sup>1</sup>University of British Columbia, CANADA, <sup>2</sup>Chalmers University of Technology, SWEDEN, <sup>3</sup>Universiti Teknologi Malaysia, MALAYSIA, and <sup>4</sup>Jungwon University, KOREA
- 20-Th LOW THERMAL-BUDGET SILICON SEALED-CAVITY MICROENCAPSULATION PROCESS**  
S. Sedky<sup>1</sup>, H. Tawfik<sup>1</sup>, A. Abdel Aziz<sup>1</sup>, S. ElSaegh<sup>1</sup>, A.B. Graham<sup>2</sup>, J. Provine<sup>2</sup>, and R. Howe<sup>2</sup>  
<sup>1</sup>American University, Cairo, EGYPT and <sup>2</sup>Stanford University, USA
- 21-M MASKLESS FABRICATION OF HIGH ASPECT RATIO STRUCTURES BY COMBINATION OF MICROMOLDING AND DIRECT DRAWING**  
J. Kim, S.-J. Paik, P-C Wang, S.-H. Kim, and M.G. Allen  
*Georgia Institute of Technology, USA*
- 22-T MICRO SUCTION CUP ARRAY FOR WET/DRY ADHESION**  
N. Thanh-Vinh, H. Takahashi, T. Kan, K. Noda, K. Matsumoto, and I. Shimoyama  
*University of Tokyo, JAPAN*

- 23-W MICRO-ASSEMBLY OF A THREE-DIMENSIONAL TETRAHEDRA BY CAPILLARY FORCES**  
J.W. van Honschoten<sup>1</sup>, A. Legrain<sup>1</sup>, J.W. Berenschot<sup>1</sup>, L. Abelmann<sup>1</sup>, and N.R. Tas<sup>1</sup>  
<sup>1</sup>University of Twente, THE NETHERLANDS and <sup>2</sup>Université de Caen Basse-Normandie, FRANCE
- 24-Th MICRO-CONTACT PRINTED MEMS**  
A. Murarka<sup>1</sup>, C. Packard<sup>2</sup>, F. Yaul<sup>1</sup>, J. Lang<sup>1</sup>, and V. Bulovic<sup>1</sup>  
<sup>1</sup>Massachusetts Institute of Technology, USA and <sup>2</sup>Colorado School of Mines, USA
- 25-M NOVEL CONDUCTIVE POLYMER MICRO-SPRING CONTACT ARRAY FOR LARGE AREA WOVEN ELECTRONIC TEXTILE**  
S. Khumpuang<sup>1</sup>, A. Ohtomo<sup>1</sup>, N. Shibayama<sup>1</sup>, K. Miyake<sup>2</sup>, and T. Itoh<sup>2</sup>  
<sup>1</sup>BEANS (Bio Electromechanical Autonomous Nano Systems), JAPAN and <sup>2</sup>National Institute of Advanced Industrial Science and Technology, JAPAN
- 26-T PATTERNED CRACKS IN THE BURIED OXIDE LAYER IMPROVE YIELD IN DEVICE RELEASE FROM SOI WAFERS**  
G.C. Hill<sup>1</sup>, J.I. Padovani<sup>1</sup>, B.W. Chui<sup>2</sup>, H.J. Mamin<sup>3</sup>, D. Rugar<sup>3</sup>, N. Harjee<sup>1</sup>, J.C. Doll<sup>1</sup>, and B.L. Pruitt<sup>1</sup>  
<sup>1</sup>Stanford University, USA, <sup>2</sup>Ben Chui Consulting, USA, and <sup>3</sup>IBM Almaden Research Center, USA
- 27-W PDMS THROUGH-HOLE FABRICATION BY SOFT LITHOGRAPHY USING CH<sub>4</sub>/HE ATMOSPHERIC RF PLASMA SURFACE TREATMENT**  
J. Choi<sup>1</sup>, K.-H. Lee<sup>2</sup>, J.A. Choi<sup>1</sup>, S.H. Lee<sup>1</sup>, and S. Yang<sup>1</sup>  
<sup>1</sup>Gwangju Institute of Science and Technology, SOUTH KOREA and <sup>2</sup>Chonnam National University, SOUTH KOREA
- 28-Th PHOTONIC CRYSTAL NICKEL AND ALUMINUM OXIDE MICROMECHANICAL DEVICES HAVING 3D INVERSE OPAL MICROSTRUCTURE**  
Z. Dai, X. Yu, H. Zhang, T. Kim, P.V. Braun, and W.P. King  
University of Illinois, Urbana-Champaign, USA
- 29-M RAPID AND LOW COST GRAYSCALE MASK FABRICATED WITH A MONOCHROME PHOTOGRAPHY PROCESS**  
Y.T. Luo, S.M. Kuo, and C.H. Lin  
National Sun Yat-Sen University, TAIWAN
- 30-T ROBUST MICROMACHINING OF COMPLIANT MECHANISMS BY NICKEL SILICIDE**  
K. Khosraviani, J. Bahari, and A.M. Leung  
Simon Fraser University, CANADA
- 31-W SILANE-FREE ATMOSPHERIC-PLASMA SILICON DEPOSITION FOR MEMS DEVICES**  
Y. Yokoyama<sup>1</sup>, T. Murakami<sup>1</sup>, S. Izuo<sup>2</sup>, Y. Yoshida<sup>1</sup>, and T. Itoh<sup>1,3</sup>  
<sup>1</sup>BEANS (Bio Electromechanical Autonomous Nano Systems), JAPAN, <sup>2</sup>Mitsubishi Electric Corporation, JAPAN, and <sup>3</sup>Advanced Industrial Science and Technology (AIST), JAPAN
- 32-Th SIMPLE REMOVAL TECHNOLOGY USING OZONE SOLUTION FOR CHEMICALLY-STABLE POLYMER USED FOR MEMS**  
H. Yanagida, S. Yoshida, M. Esashi, and S. Tanaka  
Tohoku University, JAPAN
- 33-M FABRICATION OF SHARP TIPS WITH HIGH ASPECT RATIO BY SURFACTANT-MODIFIED WET ETCHING FOR THE AFM PROBE**  
B. Tang, K. Sato, H. Tanaka, and M.A. Gosálvez  
Nagoya University, JAPAN

- 34-T SOFT POLYMER MEMS**  
A.P. Gerratt, M. Tellers, and S. Bergbreiter  
*University of Maryland, USA*
- 35-W STEREOMASK LITHOGRAPHY FOR MULTI-OBJECT BIO-PATTERNING**  
S. Zhao, A. Chen, A. Revzin, and T. Pan  
*University of California, Davis, USA*
- 36-Th ULTRA-FINE NANOFABRICATION BY HYBRID OF ENERGETIC ION INDUCED FLUIDIZATION AND STRESS**  
C. Li, K. Ding, W.G. Wu, and J. Xu  
*Peking University, CHINA*
- 37-M WAFER-LEVEL CHIP SCALE FLEXIBLE WIRELESS MICROSYSTEM FABRICATION**  
T.-Y. Chao and Y.T. Cheng  
*National Chiao Tung University, TAIWAN*
- 38-T WAFER-LEVEL INTEGRATION OF NITI SHAPE MEMORY ALLOY WIRES FOR THE FABRICATION OF MICROACTUATORS USING STANDARD WIRE BONDING TECHNOLOGY**  
A.C. Fischer, H. Gradin, S. Braun, S. Schröder, G. Stemme, and F. Niklaus  
*Royal Institute of Technology (KTH), SWEDEN*

## PACKAGING TECHNOLOGIES

- 39-W ABOVE-IC GENERIC POLY-SIGE THIN FILM WAFER LEVEL PACKAGING AND MEM DEVICE TECHNOLOGY: APPLICATION TO ACCELEROMETERS**  
B. Guo<sup>1</sup>, L. Wen<sup>2</sup>, P. Helin<sup>1</sup>, G. Claes<sup>1</sup>, A. Verbist<sup>1</sup>, R. Van Hoof<sup>1</sup>, B. Du Bois<sup>1</sup>, J. De Coster<sup>1</sup>, I. De Wolf<sup>1</sup>, A. Hadi Shahr<sup>1</sup>, Y. Li<sup>1</sup>, H. Cui<sup>1</sup>, M. Lux<sup>1</sup>, G. Vereecke<sup>1</sup>, H.A.C. Tilman<sup>1</sup>, L. Haspeslagh<sup>1</sup>, S. Decoutere<sup>1</sup>, H. Osman<sup>1</sup>, R. Puers<sup>2</sup>, S. Severi<sup>1</sup>, and A. Witvrouw<sup>1</sup>  
<sup>1</sup>IMEC, BELGIUM and <sup>2</sup>Katholieke Universiteit Leuven, BELGIUM
- 40-Th HERMETIC INTEGRATION OF LIQUIDS IN MEMS BY ROOM TEMPERATURE, HIGH-SPEED PLUGGING OF LIQUID-FILLED CAVITIES AT WAFER LEVEL**  
M. Antelius, A.C. Fischer, F. Niklaus, G. Stemme, and N. Roxhed  
*Royal Institute of Technology (KTH), SWEDEN*
- 41-M CURRENT CROWDING STUDY OF A MICRO SPRING CONTACT FOR FLIP CHIP PACKAGING**  
B. Cheng<sup>1,2</sup>, E.M. Chow<sup>1</sup>, D. De Bruyker<sup>1</sup>, I. Shubin<sup>3</sup>, J. Cunningham<sup>3</sup>, A. Chow<sup>3</sup>, J. Shi<sup>3</sup>, and K.F. Böhringer<sup>2</sup>  
<sup>1</sup>Palo Alto Research Center, Inc., USA, <sup>2</sup>University of Washington, USA, and <sup>3</sup>Oracle, USA
- 42-T PART SCALING AND MECHANICS OF THIN PART SELF-ASSEMBLY IN THE FLUIDIC PHASE**  
K.S. Park<sup>1</sup>, X. Xiong<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
- 43-W SACRIFICIAL MICROCHANNEL SEALING BY GLASS-FRIT REFLOW FOR CHIP SCALE ATOMIC MAGNETOMETER**  
K. Tsujimoto, Y. Hirai, K. Sugano, T. Tsuchiya, and O. Tabata  
*Kyoto University, JAPAN*

**44-Th UNIVERSAL ADHESIVE-FREE FIT-TO-FLOW MICROFLUIDIC CONNECTIONS**

A. Chen and T. Pan  
*University of California, Davis, USA*

**45-M WAFER-LEVEL HERMETIC PACKAGING TECHNOLOGY FOR MEMS USING ANODICALLY-BONDABLE LTCC WAFER**

S. Tanaka<sup>1</sup>, S. Matsuzaki<sup>1</sup>, M. Mohri<sup>2</sup>, A. Okada<sup>2</sup>, H. Fukushi<sup>1</sup>, and M. Esashi<sup>1</sup>  
*<sup>1</sup>Tohoku University, JAPAN and <sup>2</sup>Nikko Company, JAPAN*

**MATERIALS AND DEVICE CHARACTERIZATION**

**46-T A SILICON CARBIDE MEMS MICROHOTPLATE FOR NANOMATERIAL CHARACTERIZATION IN TEM**

B. Morana, F. Santagata, L. Mele, M. Mihailović, G. Pandraud, J.F. Creemer, and P.M. Sarro  
*Technical University Delft, THE NETHERLANDS*

**47-W A SYSTEMATIC INVESTIGATION OF THE CRITICAL TRIBOLOGICAL PROPERTIES OF A GOLD NANOPARTICLE COATING USED FOR TEXTURING MICRO-ELECTROMECHANICAL SYSTEMS SURFACES**

N. Ansari, K.M. Hurst, C.B. Roberts, and W.R. Ashurst  
*Auburn University, USA*

**48-Th CHARACTERIZATION OF GAN CANTILEVERS FABRICATED WITH GAN-ON-SILICON PLATFORM**

J.N. Lv<sup>1,2</sup>, Z.C. Yang<sup>1</sup>, G.Z. Yan<sup>1</sup>, Y. Cai<sup>2</sup>, B.S. Zhang<sup>2</sup>, and K.J. Chen<sup>3</sup>  
*<sup>1</sup>Peking University, CHINA, <sup>2</sup>Chinese Academy of Science, CHINA, and <sup>3</sup>Hong Kong University of Science and Technology, CHINA*

**49-M CONDUCTIVE POLYMER COATED FLEXIBLE ELECTRODE FOR HIGHLY EFFICIENT FORCE GENERATION OF ELECTROSTATIC ACTUATOR**

M. Ito, T. Kuwamura, J. Komoda, and S. Konishi  
*Ritsumeikan University, JAPAN*

**50-T CONTACT AND SHEET RESISTANCES OF CARBON NANOTUBE FOREST IN GAS SENSING APPLICATIONS**

Y. Jiang<sup>1</sup>, P. Wang<sup>1,2</sup>, and L. Lin<sup>1</sup>  
*<sup>1</sup>University of California, Berkeley, USA and <sup>2</sup>China Agricultural University, CHINA*

**51-W CORROSION RESISTANCE CONSOLIDATION OF A DIAPHRAGM TYPE VACUUM SENSOR**

H. Kozako<sup>1</sup>, J. Sakurai<sup>1</sup>, N. Mukai<sup>2</sup>, Y. Ohnuma<sup>2</sup>, T. Takahashi<sup>2</sup>, and S. Hata<sup>1</sup>  
*<sup>1</sup>Tokyo Institute of Technology, JAPAN and <sup>2</sup>Nabtesco Corporation, JAPAN*

**52-Th CROSS COMPARISON OF FATIGUE LIFETIME TESTING ON SILICON THIN FILM SPECIMENS**

S. Kamiya<sup>1</sup>, T. Tsuchiya<sup>2</sup>, T. Ikehara<sup>3</sup>, K. Sato<sup>4</sup>, T. Ando<sup>5</sup>, T. Namazu<sup>6</sup>, K. Takashima<sup>7</sup>  
*<sup>1</sup>Nagoya Institute of Technology, JAPAN, <sup>2</sup>Kyoto University, JAPAN, <sup>3</sup>Advanced Industrial Science and Technology, JAPAN, <sup>4</sup>Nagoya University, JAPAN, <sup>5</sup>Ritsumeikan University, JAPAN, <sup>6</sup>University of Hyogo, JAPAN, and <sup>7</sup>Kumamoto University, JAPAN*

**53-M DEVELOPMENT OF 3D CNTS INTERDIGITATED FINGER ELECTRODES ON FLEXIBLE POLYMER FOR BENDING STRAIN MEASUREMENT**

J.-Y. Wang<sup>1</sup>, C.-F. Hu<sup>1</sup>, C. Hong<sup>1</sup>, W.-S. Su<sup>2</sup>, and W. Fang<sup>1,2</sup>  
*<sup>1</sup>National Tsing Hua University, TAIWAN and <sup>2</sup>National Nano Device Laboratories, TAIWAN*

- 54-T DIRECT MEASUREMENT OF FIELD EMISSION CURRENT IN E-STATIC MEMS STRUCTURES**  
A. Garg, V. Ayyaswamy, A. Kovacs, A. Alexeenko, and D. Peroulis  
*Purdue University, USA*
- 55-W ELECTROPLATING PROCESS OF NI-CNTS NANOCOMPOSITE FOR MEMS RESONATOR FABRICATION**  
Y.-C. Lee, Y.T. Cheng, and W. Hsu  
*National Chiao Tung University, TAIWAN*
- 56-Th ELECTROSTATIC OSCILLATION OF CNT BUNDLES**  
P. Wang<sup>1,2</sup>, X. Yan<sup>3</sup>, Y. Jiang<sup>1</sup>, W. Li<sup>2</sup>, and L. Lin<sup>1</sup>  
<sup>1</sup>University of California, Berkeley, USA, <sup>2</sup>China Agricultural University, CHINA, and <sup>3</sup>Beihang University, CHINA
- 57-M EXPERIMENTAL VERIFICATION OF INTERNAL FRICTION AT GHZ FREQUENCIES IN DOPED SINGLE-CRYSTAL SILICON**  
E. Hwang and S.A. Bhave  
*Cornell University, USA*
- 58-T FE-B-NB-ND MAGNETIC METALLIC GLASS THIN FILM FOR MEMS/NEMS STRUCTURE**  
T.A. Phan, S.M. Lee, A. Makino, H. Oguchi, and H. Kuwano  
*Tohoku University, JAPAN*
- 59-W FINITE FATIGUE LIFETIME OF SILICON UNDER INERT ENVIRONMENT**  
S. Kamiya<sup>1</sup>, Y. Ikeda<sup>1</sup>, M. Ishikawa<sup>1</sup>, H. Izumi<sup>1</sup>, J. Gaspar<sup>2</sup>, and O. Paul<sup>2</sup>  
<sup>1</sup>Nagoya Institute of Technology, JAPAN and <sup>2</sup>University of Freiburg - IMTEK, GERMANY
- 60-Th FRACTURE TOUGHNESS OF SI THIN FILM AT VERY LOW TEMPERATURES BY TENSILE TEST**  
T. Ando<sup>1</sup>, T. Takumi<sup>2</sup>, S. Nozue<sup>2</sup>, K. Sato<sup>2</sup>  
<sup>1</sup>Ritsumeikan University, JAPAN and <sup>2</sup>Nagoya University, JAPAN
- 61-M FRICTION, ADHESION, AND WEAR PROPERTIES OF PDMS COATINGS IN MEMS DEVICES**  
I. Penskiy, A.P. Gerratt, and S. Bergbreiter  
*University of Maryland, USA*
- 62-T GAMMA IRRADIATION EFFECTS ON RESISTANCE OF SURFACE MICROMACHINED POLYCRYSTALLINE SILICON BEAMS IN MEMS**  
L. Wang, J. Tang, J. Song, and Q.-A. Huang  
*Southeast University, CHINA*
- 63-W LOCAL STRESS ANALYSIS OF SINGLE CRYSTALLINE SILICON RESONATOR USING MICRO RAMAN SPECTROSCOPY**  
A. Taniyama<sup>1</sup>, Y. Hirai<sup>1</sup>, K. Sugano<sup>1</sup>, O. Tabata<sup>1</sup>, T. Ikehara<sup>2</sup>, and T. Tsuchiya<sup>1</sup>  
<sup>1</sup>Kyoto University, JAPAN and <sup>2</sup>National Institute of Advanced Industrial Science and Technology (AIST), JAPAN
- 64-Th MECHANICAL BEHAVIOR OF MICROSTRUCTURES FROM A CHEMO-RESPONSIVE POLYMER NANOCOMPOSITE BASED ON COTTON CELLULOSE NANOFIBERS**  
A.E. Hess<sup>1</sup>, K. Shanmuganathan<sup>1</sup>, J.R. Capadona<sup>1</sup>, L. Hsu<sup>1</sup>, S.J. Rowan<sup>1</sup>, C. Weder<sup>2</sup>, D.J. Tyler<sup>1</sup>, and C.A. Zorman<sup>1</sup>  
<sup>1</sup>Case Western Reserve University, USA and <sup>2</sup>University of Fribourg, SWITZERLAND



- 65-M MICROMECHANICAL SENSORS FOR THE MEASUREMENT OF BIOPOLYMER DEGRADATION**  
S.S. Keller, L. Gammelgaard, M.P. Jensen, S. Schmid, Z.J. Davis, and A. Boisen  
*Technical University of Denmark, DENMARK*
- 66-T MICROSCOPIC MEASUREMENT OF STRAIN DISTRIBUTION ON MEMS DEVICE USING THREE DIMENSIONAL ORIENTATION MICROSCOPE**  
K. Yoshiki<sup>1</sup>, S. Yoshida<sup>1</sup>, T. Namazu<sup>1</sup>, N. Araki<sup>1</sup>, M. Hashimoto<sup>2</sup>, M. Kurihara<sup>3</sup>, N. Hashimoto<sup>3</sup>, and S. Inoue<sup>1</sup>  
<sup>1</sup>University of Hyogo, JAPAN, <sup>2</sup>Osaka University, JAPAN, and <sup>3</sup>Citizen Holdings Co., Ltd, JAPAN
- 67-W NEAR-CONTACT DAMPING MODEL AND DYNAMIC RESPONSE OF  $\mu$ -BEAMS UNDER HIGH-G LOADS**  
D. Parkos<sup>1</sup>, N. Raghunathan<sup>2</sup>, V. Ayyaswamy<sup>2</sup>, A. Alexeenko<sup>1</sup>, and D. Peroulis<sup>2</sup>  
<sup>1</sup>Purdue University, USA and <sup>2</sup>Birck Nanotechnology Center, USA
- 68-Th NONLINEAR PIEZORESISTANCE OF SILICON AT LARGE STRESSES**  
J. Gaspar, J. Gutmann, B. Lemke, and O. Paul  
*University of Freiburg - IMTEK, GERMANY*
- 69-M PARYLENE-C AS A PIEZOELECTRIC MATERIAL**  
J.Y.-H. Kim<sup>1</sup>, A. Cheng<sup>2</sup>, and Y.-C. Tai<sup>1</sup>  
<sup>1</sup>California Institute of Technology, USA and <sup>2</sup>Cornell University, USA
- 70-T POLYSILICON-FILLED CARBON NANOTUBE GRASS STRUCTURAL MATERIAL FOR MICROMECHANICAL RESONATORS**  
W.-C. Li, Y. Jiang, R.A. Schneider, H.G. Barrow, L. Lin, and C.T.-C. Nguyen  
*University of California, Berkeley, USA*
- 71-W QUALITY FACTOR IMPROVEMENT OF SILICON NITRIDE MICRO STRING RESONATORS**  
S. Schmid, B. Malm, and A. Boisen  
*Technical University of Denmark, DENMARK*
- 72-Th REAL-TIME SYNCHRONOUS IMAGING OF ELECTROMECHANICAL RESONATOR MODE AND EQUILIBRIUM PROFILES**  
Y. Linzon<sup>1</sup>, D. Joe<sup>1</sup>, R.A. Barton<sup>1</sup>, R.B. Ilic<sup>1</sup>, S. Krylov<sup>2</sup>, J.M. Parpia<sup>1</sup>, and H.G. Craighead<sup>1</sup>  
<sup>1</sup>Cornell University, USA and <sup>2</sup>Tel Aviv University, ISRAEL
- 73-M SIMULTANEOUS DUAL-MODE EXCITATION OF PIEZO-ON-SILICON MICROMECHANICAL OSCILLATOR FOR SELF-TEMPERATURE SENSING**  
M.J. Dalal, J.L. Fu, and F. Ayazi  
*Georgia Institute of Technology, USA*
- 74-T STRAIN RATE DEPENDENCE OF MECHANICAL PROPERTIES FOR SUB 100 NM-THICK AU FILM USING ELECTROSTATICALLY ACTUATED NANO TENSILE TESTING DEVICE**  
H.-J. Oh<sup>1</sup>, I. Hanasaki<sup>1</sup>, Y. Isono<sup>1</sup>, S.-W. Han<sup>2</sup>, and H.-J. Lee<sup>2</sup>  
<sup>1</sup>Kobe University, JAPAN and <sup>2</sup>Korea Institute of Machinery and Materials, SOUTH KOREA
- 75-W TUNABLE MECHANICAL PROPERTIES OF SELF-ASSEMBLED SWNT/POLYMER NANOCOMPOSITE FILMS FOR MEMS**  
D. Zhang and T. Cui  
*University of Minnesota, USA*

- 76-Th STUDY ON THE RELIABILITY OF THE MECHANICAL SHUTTER UTILIZING ROLL ACTUATORS**  
C.-H. Kim and S. Hong  
*Samsung Electronics Co., Ltd., SOUTH KOREA*
- 77-M ULTRATHIN PARYLENE-C SEMIPERMEABLE MEMBRANES FOR BIOMEDICAL APPLICATIONS**  
B. Lu, Z. Liu, and Y.-C. Tai  
*California Institute of Technology, USA*
- 78-T ZR-BASED METALLIC GLASS AS A NOVEL MEMS BONDING MATERIAL**  
Y.-C. Lin<sup>1</sup>, J. Froemel<sup>2,3</sup>, P. Sharma<sup>1</sup>, A. Inoue<sup>1</sup>, M. Esashi<sup>1</sup>, and T. Gessner<sup>1,3</sup>  
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<sup>3</sup>*Chemnitz University of Technology, GERMANY*

## **MECHANICAL SENSORS AND SYSTEMS**

- 79-W 3D AIRFLOW VELOCITY VECTOR SENSOR**  
N. Minh-Dung, H. Takahashi, K. Kuwana, T. Takata, K. Matsumoto, and I. Shimoyama  
*University of Tokyo, JAPAN*
- 80-Th 4.8 MHZ AFM NANOPROBES WITH CAPACITIVE TRANSDUCERS AND BATCH-FABRICATED NANOTIPS**  
B. Walter, M. Faucher, E. Mairiaux, Z. Xiong, L. Buchailot, and B. Legrand  
*IEMN CNRS, FRANCE*
- 81-M 6.4 GHZ ACOUSTIC SENSOR FOR IN-SITU MONITORING OF AFM TIP WEAR**  
T.J. Cheng<sup>1</sup>, J.H. Han<sup>2</sup>, M. Ziwocky<sup>2</sup>, C.H. Lee<sup>2</sup>, and S.A. Bhav<sup>1</sup>  
<sup>1</sup>*Cornell University, USA* and <sup>2</sup>*Marquette University, USA*
- 82-T A GAS SENSOR BASED ON VISCOSITY CHANGE OF IONIC LIQUID**  
K. Ohsawa, H. Takahashi, K. Noda, T. Kan, K. Matsumoto, and I. Shimoyama  
*University of Tokyo, JAPAN*
- 83-W A NEW BIAxIAL SILICON RESONANT MICRO ACCELEROMETER**  
C. Comi<sup>1</sup>, A. Corigliano<sup>1</sup>, G. Langfelder<sup>1</sup>, A. Longoni<sup>1</sup>, A. Tocchio<sup>1</sup>, and B. Simoni<sup>2</sup>  
<sup>1</sup>*Politecnico di Milano, ITALY* and <sup>2</sup>*ST Microelectronics, ITALY*
- 84-Th A NOVEL ACCELEROMETER BASED ON CONTACT RESISTANCE OF INTEGRATED CARBON NANOTUBES**  
J.-I. Lee, Y. Eun, H.-I. Jung, J. Choi, and J. Kim  
*Yonsei University, SOUTH KOREA*
- 85-M A NOVEL ELECTROSTATICALLY ACTUATED AFM PROBE FOR VIBRO-FLEXURAL MODE OPERATION**  
E. Sarajlic<sup>1</sup>, M.H. Siekman<sup>2</sup>, H. Fujita<sup>3</sup>, L. Abelmann<sup>2</sup>, and N. Tas<sup>2</sup>  
<sup>1</sup>*SmartTip B.V., THE NETHERLANDS*, <sup>2</sup>*MESA+, University of Twente, THE NETHERLANDS*, and  
<sup>3</sup>*University of Tokyo, JAPAN*
- 86-T A NOVEL TACTILE SENSING ARRAY WITH IMAGE RETAINING AND ERASING CAPABILITIES USING CNT-PDMS POLYMER MIXED BY DIELECTROPHORESIS**  
Y.M. Chen, Y.T. Lai, and Y.J. Yang  
*National Taiwan University, TAIWAN*

- 87-W A RESONANT TUNING FORK FORCE SENSOR WITH UNPRECEDENTED COMBINATION OF RESOLUTION AND RANGE**  
K. Azgin<sup>1</sup>, C. Ro<sup>1</sup>, A. Torrents<sup>1</sup>, T. Akin<sup>2</sup>, and L. Valdevit<sup>1</sup>  
<sup>1</sup>University of California, Irvine, USA and <sup>2</sup>Middle East Technical University, TURKEY
- 88-Th A SUBNANOWATT MICROBUBBLE PRESSURE SENSOR BASED ON ELECTROCHEMICAL IMPEDANCE TRANSDUCTION IN A FLEXIBLE ALL-PARYLENE PACKAGE**  
C.A. Gutierrez and E. Meng  
University of Southern California, USA
- 89-M A TACTILE SENSING ARRAY WITH TUNABLE SENSING RANGES USING LIQUID CRYSTAL AND CARBON NANOTUBES COMPOSITES**  
Y.-T. Lai<sup>1</sup>, W.-C. Kuo<sup>2</sup>, and Y.-J. Yang<sup>1</sup>  
<sup>1</sup>National Taiwan University, TAIWAN and  
<sup>2</sup>National Kaohsiung First University of Science and Technology, TAIWAN
- 90-T AN ULTRA-HIGH SENSITIVITY, CAPACITIVE PRESSURE SENSOR USING IONIC LIQUID**  
J. Yan and T. Pan  
University of California, Davis, USA
- 91-W DETECTING INTERNAL DEFECT OF NON-CERAMIC INSULATORS USING A NOVEL MICROMACHINED ELECTRIC FIELD SENSOR**  
C. Peng, P. Yang, S. Liu, H. Zhang, K. Feng, and S. Xia  
Chinese Academy of Sciences, CHINA
- 92-Th DEVELOPMENT OF PASSIVE SURFACE ACOUSTIC WAVE GYROSCOPE WITH STANDING WAVE MODE**  
H.K. Oh, S.S. Yang, and K. Lee  
Ajou University, SOUTH KOREA
- 93-M EFFECT OF QUADRATURE ERROR ON THE PERFORMANCE OF A FULLY-DECOUPLED MEMS GYROSCOPE**  
E. Tatar, S.E. Alper, and T. Akin  
Middle East Technical University, TURKEY
- 94-T FLEXIBLE DISTRIBUTED CAPACITIVE SENSOR WITH ENCAPSULATED FERROELECTRIC LIQUID**  
Y. Hotta<sup>1</sup>, Y. Zhang<sup>1</sup>, and N. Miki<sup>1,2</sup>  
<sup>1</sup>Keio University, JAPAN and <sup>2</sup>Japan Science and Technology Agency (JST), JAPAN
- 95-W FREQUENCY MODULATION BASED ANGULAR RATE SENSOR**  
S.A. Zotov, I.P. Prihodko, A.A. Trusov, and A.M. Shkel  
University of California, Irvine, USA
- 96-Th GALLIUM NITRIDE APPROACH FOR MEMS RESONATORS WITH HIGHLY TUNABLE PIEZO-AMPLIFIED TRANSDUCERS**  
M. Faucher<sup>1</sup>, Y. Cordier<sup>2</sup>, F. Semond<sup>2</sup>, V. Brandli<sup>1</sup>, B. Grimbert<sup>1</sup>, A. Ben Amar<sup>1</sup>, M. Werquin<sup>3</sup>,  
C. Boyaval<sup>1</sup>, C. Gaquière<sup>1</sup>, D. Théron<sup>1</sup>, L. Buchaillot<sup>1</sup>  
<sup>1</sup>CNRS - IEMN, FRANCE, <sup>2</sup>CNRS-CRHEA, FRANCE, and <sup>3</sup>MC2-Technologies, FRANCE
- 97-M HEWLETT PACKARD'S SEISMIC GRADE MEMS ACCELEROMETER**  
B. Homeijer, D. Lazaroff, D. Milligan, R. Alley, J. Wu, M. Szepesi, B. Bicknell, Z. Zhang,  
R.G. Walmsley, and P.G. Hartwell  
Hewlett Packard, USA

- 98-T IMPLEMENTATION OF FULLY-DIFFERENTIAL CAPACITANCE SENSING ACCELEROMETER USING GLASS PROOF-MASS WITH SI-VIAS**  
Y.-C. Hsu<sup>1</sup>, C.-W. Lin<sup>1</sup>, C.-M. Sun<sup>2</sup>, C.-P. Hsu<sup>1</sup>, Y.-T. Lee<sup>1</sup>, M.-H. Tsai<sup>1</sup>, Y.-C. Liu<sup>1</sup>, and W. Fang<sup>1</sup>  
<sup>1</sup>National Tsing Hua University, TAIWAN and <sup>2</sup>PixArt Imaging Inc., TAIWAN
- 99-W LOW POWER 3-AXIS LORENTZ FORCE NAVIGATION MAGNETOMETER**  
M.J. Thompson, M. Li, and D.A. Horsley  
University of California, Davis, USA
- 100-Th MICROSHUTTERS FOR MEMS-BASED TIME-OF-FLIGHT MEASUREMENTS IN SPACE**  
K. Brinkfeldt<sup>1</sup>, P. Enoksson<sup>2</sup>, M. Wieser<sup>3</sup>, S. Barabash<sup>3</sup>, and M. Emanuelsson<sup>3</sup>  
<sup>1</sup>Swerea IVF, SWEDEN, <sup>2</sup>Chalmers University of Technology, SWEDEN, and <sup>3</sup>Swedish Institute of Space Physics, SWEDEN
- 101-M MODELING AND CHARACTERIZATION OF A CMOS SENSOR WITH SURFACE TRENCHES FOR HIGH-PRESSURE APPLICATIONS**  
M. Baumann, P. Ruther, and O. Paul  
University of Freiburg - IMTEK, GERMANY
- 102-T NOVEL CONCEPT FOR A MEMS MICROPHONE WITH DUAL CHANNELS FOR AN ULTRAWIDE DYNAMIC RANGE**  
T. Kasai<sup>1</sup>, S. Sato<sup>1</sup>, S. Conti<sup>2</sup>, I. Padovani<sup>2</sup>, F. David<sup>2</sup>, Y. Uchida<sup>1</sup>, T. Takahashi<sup>1</sup>, and H. Nishio<sup>1</sup>  
<sup>1</sup>OMRON Corporation, JAPAN and <sup>2</sup>STMicroelectronics, ITALY
- 103-W OPTIMAL T-SUPPORT ANCHORING FOR BAR-TYPE BAW RESONATORS**  
R. Jansen<sup>1</sup>, S. Stoffels<sup>1,2</sup>, X. Rottenberg<sup>1</sup>, Y. Zhang<sup>3</sup>, J. De Coster<sup>1</sup>, S. Donnay<sup>1</sup>, S. Severi<sup>1</sup>, J. Borremans<sup>1</sup>, M. Lofrano<sup>1</sup>, G. van der Plas<sup>1</sup>, P. Verheyen<sup>1</sup>, W. de Raedt<sup>1</sup>, and H.A.C. Tilmans<sup>1</sup>  
<sup>1</sup>IMEC, BELGIUM, <sup>2</sup>Katholieke Universiteit Leuven, BELGIUM, and <sup>3</sup>GroepT, BELGIUM
- 104-Th PARALLEL ARRAY OF NOISE-ACTIVATED NONLINEAR MICRO-RESONATORS WITH INTEGRATED ACTUATORS**  
Y. Yoshida, Y. Kawai, and T. Ono  
Tohoku University, JAPAN
- 105-M PARAMETRIC AMPLIFICATION/DAMPING IN MEMS GYROSCOPES**  
M. Sharma, E.H. Sarraf, and E. Cretu  
University of British Columbia, CANADA
- 106-T PHOTONIC CRYSTAL BASED ALL-OPTICAL PRESSURE SENSOR**  
Y. Lu and A. Lal  
Cornell University, USA
- 107-W PIEZORESISTIVITY CHARACTERIZATION OF SILICON NANOWIRES USING A MEMS DEVICE**  
Y. Zhang<sup>1</sup>, X. Liu<sup>1,2</sup>, C. Ru<sup>1,3</sup>, Y. Zhang<sup>1</sup>, L. Dong<sup>4</sup>, P. Woo<sup>5</sup>, M. Nakamura<sup>5</sup>, D. Hoyle<sup>5</sup>, I. Cotton<sup>5</sup>, and Y. Sun<sup>1</sup>  
<sup>1</sup>University of Toronto, CANADA, <sup>2</sup>Harvard University, USA, <sup>3</sup>Soochow University, CHINA, <sup>4</sup>Michigan State University, USA, and <sup>5</sup>Hitachi High-Technologies Canada Inc., CANADA
- 108-Th SELF-SUSTAINED MICROMECHANICAL RESONANT PARTICULATE MICROBALANCE/COUNTERS**  
A. Hajjam, J.C. Wilson, A. Rahafrooz, and S. Pourkamali  
University of Denver, USA

- 109-M SI ACOUSTIC DELAY LINES AND THE EFFECT OF CURRENT ON ACOUSTIC WAVE ATTENUATION AND SPEED**  
L. Chen and M. Tabib-Azar  
*University of Utah, USA*
- 110-T SILICON-INTEGRATED PHONONIC BANDGAP CRYSTAL PLATFORM FOR SENSORS AND SIGNAL PROCESSING ELEMENTS: THEORY AND EXPERIMENT**  
R.C. Norris, J.S. Hamel, and P. Nieva  
*University of Waterloo, CANADA*
- 111-W STOCHASTIC STRAIN SENSOR USING PULL-IN PROBABILITY UNDER WHITE-NOISE-APPLIED BISTABLE STATE WITH RELIABLE PULL-IN RELEASE MECHANISM**  
Y. Hatakeyama, M. Esashi, and S. Tanaka  
*Tohoku University, JAPAN*
- 112-Th A THIN FILM PIEZOELECTRIC PVDF-TrFE BASED IMPLANTABLE PRESSURE SENSOR USING LITHOGRAPHIC PATTERNING**  
S.-S. Je<sup>1</sup>, T. Sharma<sup>1</sup>, Y. Lee<sup>1</sup>, B. Gill<sup>2</sup>, and J.X. Zhang<sup>1</sup>  
<sup>1</sup>*University of Texas, Austin, USA and* <sup>2</sup>*University of Texas Health Science Center, Houston, USA*
- 113-M TOWARDS HIGH-RESOLUTION FLOW CAMERAS MADE OF ARTIFICIAL HAIR FLOW-SENSORS FOR FLOW PATTERN RECOGNITION**  
A.M.K. Dagamseh, T.S.J. Lammerink, R. Sanders, R.J. Wiegerink, and G.J.M. Krijnen  
*MESA+, University of Twente, THE NETHERLANDS*
- 114-T UNRAVELING THE VISCOSITY-MEDIATED COUPLING EFFECT IN BIOMIMETIC HAIR SENSOR ARRAYS**  
R.K. Jaganatharaja, H. Droogendijk, S. Vats, B. Hagedoorn, C.M. Bruinink, and G.J.M. Krijnen  
*University of Twente, THE NETHERLANDS*
- 115-W VERY HIGH STABILITY ACHIEVEMENT IN MEMS BASED AC VOLTAGE REFERENCES**  
F. Blard<sup>1,2,3</sup>, A. Bounouh<sup>2</sup>, D. Bélières<sup>1</sup>, and H. Camon<sup>2,3</sup>  
<sup>1</sup>*Laboratoire National de métrologie et d'Essais, FRANCE,* <sup>2</sup>*LAAS-CNRS, FRANCE, and* <sup>3</sup>*University of Toulouse, FRANCE*
- 116-Th WIRELESS TEMPERATURE MICROSENSORS INTEGRATED ON BEARINGS FOR HEALTH MONITORING APPLICATIONS**  
S. Scott, A. Kovacs, L. Gupta, J. Katz, F. Sadeghi, and D. Peroulis  
*Purdue University, USA*

## **PHYSICAL MEMS (OPTICAL, MAGNETO)**

- 117-M A MEMS-SOI 3D-MAGNETIC FIELD SENSOR**  
H.V. Estrada  
*CENAM, MEXICO*
- 118-T A MICRODISCHARGE-BASED RADIATION DETECTOR UTILIZING STACKED ELECTRODE ARRAYS IN A TO-5 PACKAGE**  
C.K. Eun and Y.B. Gianchandani  
*University of Michigan, USA*
- 119-W A THZ DUAL MODE SWITCH USING MEMS SWITCHABLE METAMATERIAL**  
W. Zhang<sup>1</sup>, W.M. Zhu<sup>1</sup>, Y.H. Fu<sup>1</sup>, J.F. Tao<sup>1</sup>, D.P. Tsai<sup>2</sup>, G.Q. Lo<sup>3</sup>, D.L. Kwong<sup>3</sup>, and A.W. Liu<sup>1</sup>  
<sup>1</sup>*Nanyang Technological University, SINGAPORE,* <sup>2</sup>*National Taiwan University, TAIWAN, and* <sup>3</sup>*Institute of Microelectronics, SINGAPORE*

- 120-Th ALD-METAL UNCOOLED BOLOMETER**  
S. Yoneoka<sup>1</sup>, M. Liger<sup>2</sup>, G. Yama<sup>2</sup>, R. Schuster<sup>2</sup>, F. Purkl<sup>2</sup>, J. Provine<sup>1</sup>, F.B. Prinz<sup>1</sup>,  
R.T. Howe<sup>1</sup>, and T.W. Kenny<sup>1</sup>  
<sup>1</sup>Stanford University, USA and <sup>2</sup>Robert Bosch LLC Research and Technology Center, USA
- 121-M BROADBAND TUNABLE 3D METAMATERIALS AT TERAHERTZ FREQUENCIES**  
K. Fan, A.C. Strikwerda, H. Tao, R.D. Averitt, and X. Zhang  
Boston University, USA
- 122-T FABRICATION AND CHARACTERIZATION OF 3D INTEGRATED  
2 DOF MICROMIRROR ARRAYS FOR EXCESSIVE THERMAL LOADS**  
Ç. Ataman, S. Lani, W. Noell, F. Jutzi, D. Bayat, and N. de Rooij  
Ecole Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND
- 123-W FABRICATION AND CHARACTERIZATION OF SILICON  
MICRO MIRROR WITH CNT HINGE**  
B.T. Tung<sup>1</sup>, V.T. Dau<sup>1</sup>, D.V. Dao<sup>1</sup>, T. Yamada<sup>2</sup>, K. Hata<sup>2,3</sup>, and S. Sugiyama<sup>1</sup>  
<sup>1</sup>Ritsumeikan University, JAPAN, <sup>2</sup>National Institute of Advanced Industrial Science and Technology (AIST),  
JAPAN, and <sup>3</sup>Japan Science and Technology Agency (JST), JAPAN
- 124-Th FLUIDIC ZOOM LENS SYSTEM USING TWO SINGLE CHAMBER  
ADAPTIVE LENSES WITH INTEGRATED ACTUATION**  
J. Draheim, T. Burger, F. Schneider, and U. Wallrabe  
University of Freiburg - IMTEK, GERMANY
- 125-M HIDDEN-HINGE MICRO-MIRROR ARRAYS MADE BY HETEROGENEOUS  
INTEGRATION OF TWO MONO-CRYSTALLINE SILICON LAYERS**  
M.A. Lapisa<sup>1</sup>, F. Zimmer<sup>2</sup>, A. Gehner<sup>2</sup>, G. Stemme<sup>1</sup>, and F. Niklaus<sup>1</sup>  
<sup>1</sup>Royal Institute of Technology (KTH), SWEDEN and  
<sup>2</sup>Fraunhofer Institute for Photonic Microsystems (IPMS), GERMANY
- 126-T MEMS-BASED WEARABLE LINE-OF-SIGHT DETECTION SYSTEM USING  
MICRO-PATTERNED TRANSPARENT OPTICAL SENSORS ON EYEGLASSES**  
A. Oikawa<sup>1</sup>, T. Muro<sup>1</sup>, and N. Miki<sup>1,2</sup>  
<sup>1</sup>Keio University, JAPAN and <sup>2</sup>Japan Science and Technology Agency (JST), JAPAN
- 127-W MEMS-ENABLED MECHANICALLY-TUNABLE 2D PHOTONIC CRYSTAL LENS**  
Y. Cui<sup>1,2</sup>, V.A. Tamma<sup>2</sup>, W. Park<sup>2</sup>, and J.-B. Lee<sup>1</sup>  
<sup>1</sup>University of Texas, Dallas, USA and <sup>2</sup>University of Colorado, Boulder, USA
- 128-Th MICRO MIRROR ARRAYS FOR IMPROVED SENSITIVITY  
OF THERMOPILE INFRARED SENSORS**  
M. Ohira<sup>1</sup>, Y. Koyama<sup>1</sup>, F. Aita<sup>1</sup>, S. Sasaki<sup>1</sup>, M. Oba<sup>1</sup>, T. Takahata<sup>2</sup>, I. Shimoyama<sup>2</sup>, and M. Kimata<sup>3</sup>  
<sup>1</sup>OMRON Corporation, JAPAN, <sup>2</sup>University of Tokyo, JAPAN, and <sup>3</sup>Ritsumeikan University, JAPAN
- 129-M MICROFABRICATION AND THERMAL BEHAVIOR OF MINIATURE  
CESIUM-VAPOR CELLS FOR ATOMIC CLOCK OPERATIONS**  
M. Hasegawa<sup>1</sup>, R.K. Chutani<sup>1</sup>, C. Gorecki<sup>1</sup>, R. Boudot<sup>1</sup>, P. Dziuban<sup>1</sup>, S. Galliou<sup>1</sup>, N. Passilly<sup>1</sup>,  
V. Giordano<sup>1</sup>, and A. Jornod<sup>2</sup>  
<sup>1</sup>FEMTO-ST, FRANCE and <sup>2</sup>Swatch Group Research and Development Ltd, SWITZERLAND
- 130-T MINIATURE WISHBONE INTERFEROMETER USING ROTARY COMB  
DRIVE ACTUATOR FOR ENVIRONMENT GAS MONITORING**  
Y.M. Lee, M. Toda, M. Esashi, and T. Ono  
Tohoku University, JAPAN

- 131-W STABLE, HIGH-Q FABRY-PEROT RESONATORS WITH LONG CAVITY BASED ON CURVED, ALL-SILICON, HIGH REFLECTANCE MIRRORS**  
M. Malak<sup>1</sup>, N. Pavy<sup>1</sup>, F. Marty<sup>1</sup>, Y.-A. Peter<sup>2</sup>, A.Q. Liu<sup>3</sup>, and T. Bourouina<sup>1</sup>  
<sup>1</sup>Université Paris-Est, FRANCE, <sup>2</sup>Ecole Polytechnique de Montréal, CANADA, and <sup>3</sup>Nanyang Technological University, Singapore, Singapore
- 132-Th THERMOPILE IR DETECTOR WITH FILTER COINTEGRATED BY WAFER BONDING TECHNIQUE**  
D.H. Xu, B. Xiong, E.R. Jing, G.Q. Wu, and Y.L. Wang  
Chinese Academy of Sciences, CHINA
- 133-M TUNABLE ALL-SILICONE MULTI-CHAMBER ACHROMATIC MICROLENS**  
P. Waibel, D. Mader, P. Liebetraut, H. Zappe, and A. Seifert  
University of Freiburg - IMTEK, GERMANY
- 134-T ULTRA-COMPACT MICRO-MIRROR WITH POLYMERIC HARD MAGNET FOR USE IN ENDOSCOPIC IMAGING**  
N. Weber, D. Hertkorn, H. Zappe, and A. Seifert  
University of Freiburg - IMTEK, GERMANY
- 135-W VERY LARGE SCALE HETEROGENEOUS SYSTEM INTEGRATION FOR 1-MEGAPIXEL MONO-CRYSTALLINE SILICON MICRO-MIRROR ARRAY ON CMOS DRIVING ELECTRONICS**  
F. Zimmer<sup>1</sup>, M. Lapisa<sup>2</sup>, T. Bakke<sup>3</sup>, M. Bring<sup>1</sup>, G. Stemme<sup>2</sup>, and F. Niklaus<sup>2</sup>  
<sup>1</sup>Fraunhofer Institute for Photonic Microsystems, GERMANY, <sup>2</sup>Royal Institute of Technology (KTH), SWEDEN, and <sup>3</sup>SINTEF, NORWAY

## RF MEMS

- 136-Th 1 GHZ PHONONIC BAND GAP STRUCTURE IN AIR/ALUMINUM NITRIDE FOR SYMMETRIC LAMB WAVES**  
N.-K. Kuo and G. Piazza  
University of Pennsylvania, USA
- 137-M 50Ω-TERMINATED 900MHZ MONOLITHIC LATERAL-EXTENSIONAL PIEZOELECTRIC FILTERS ON ULTRANANOCRYSTALLINE DIAMOND**  
H. Fatemi<sup>1</sup>, B.P. Harrington<sup>1</sup>, H. Zeng<sup>2</sup>, J. Carlisle<sup>2</sup>, and R. Abdolvand<sup>1</sup>  
<sup>1</sup>Oklahoma State University, USA and <sup>2</sup>Advanced Diamond Technologies, Inc., USA
- 138-T A 4-BIT RF MEMS PHASE SHIFTER MONOLITHICALLY INTEGRATED WITH CONVENTIONAL CMOS**  
J. Reinke, L. Wang, G.K. Fedder, and T. Mukherjee  
Carnegie Mellon University, USA
- 139-W A HIGH-PERFORMANCE, TEMPERATURE-STABLE, CONTINUOUSLY TUNED MEMS CAPACITOR**  
Y. Shim, Z. Wu, and M. Rais-Zadeh  
University of Michigan, USA
- 140-Th A NOVEL SI-BASED ANTENNA WITH SUSPENDING AND ELECTROMAGNETIC BAND-GAP STRUCTURES**  
I.Y. Huang, K.H. Lin, C.H. Sun, and K.Y. Hsu  
National Sun Yat-Sen University, TAIWAN

- 141-M ACTIVE SELF-Q-ENHANCEMENT IN HIGH FREQUENCY THERMALLY ACTUATED M/NEMS RESONATORS**  
A. Rahafrooz and S. Pourkamali  
*University of Denver, USA*
- 142-T A ROBUST HIGH POWER-HANDLING (>10 W) RF MEMS SWITCHED CAPACITOR**  
I.C. Reines and G.M. Rebeiz  
*University of California, San Diego, USA*
- 143-W IMPROVEMENT IN TEMPERATURE CHARACTERISTICS OF PLATE WAVE RESONATOR USING ROTATED Y-CUT LITAO<sub>3</sub> / SIN STRUCTURE**  
H. Kando, M. Watanabe, S. Kido, T. Iwamoto, K. Ito, N. Hayakawa, K. Araki, I. Hatsuda, T. Takano, Y. Nagao, T. Nakao, T. Toi, and Y. Yoshii  
*Murata Manufacturing, JAPAN*
- 144-Th MEMS VARIABLE CAPACITOR WITH SUPERIOR LINEARITY AND LARGE TUNING RATIO BY MOVING THE PLATE TO THE INCREASING-GAP DIRECTION**  
C.-H. Han, D.-H. Choi, S.-J. Choi, and J.-B. Yoon  
*Korea Advanced Institute of Science and Technology (KAIST), SOUTH KOREA*
- 145-M METAL FOIL RF MICRO-RELAY WITH INTEGRATED HEAT SINK FOR HIGH POWER APPLICATIONS**  
F.M. Ozkeskin, S. Choi, K. Sarabandi, and Y.B. Gianchandani  
*University of Michigan, USA*
- 146-T PHASE NOISE SHAPING VIA FORCED NONLINEARITY IN PIEZOELECTRICALLY ACTUATED SILICON MICROMECHANICAL OSCILLATORS**  
M. Pardo<sup>1,3</sup>, L. Sorenson<sup>1</sup>, W. Pan<sup>2</sup>, and F. Ayazi<sup>1</sup>  
<sup>1</sup>*Georgia Institute of Technology, USA*, <sup>2</sup>*Integrated Device Technology, USA*, and <sup>3</sup>*Fundación Universidad del Norte, COLOMBIA*
- 147-W QUASI-LINEAR FREQUENCY TUNING FOR CMOS-MEMS RESONATORS**  
W.-C. Chen, W. Fang, and S.-S. Li  
*National Tsing Hua University, TAIWAN*
- 148-Th SILICON CARBIDE LATERAL OVERTONE BULK ACOUSTIC RESONATOR WITH ULTRAHIGH QUALITY FACTOR**  
M. Ziaei-Moayyed, S.D. Habermehl, D.W. Branch, P.J. Clews, and R.H. Olsson III  
*Sandia National Laboratories, USA*
- 149-M SMALL, LOW-OHMIC RF MEMS SWITCHES WITH THIN-FILM PACKAGE**  
O. Wunnicke, H. Kwinten, L. van Leuken-Peters, M. in 't Zandt, K. Reimann, V. Aravindh, H.M.R. Suy, M.J. Goossens, R.A.M Wolters, W.F.A. Besling, J.T.M. van Beek, P.G. Steeneken  
*NXP Semiconductors, THE NETHERLANDS*
- 150-T SYSTEM-LEVEL CHARACTERIZATION OF BIAS NOISE EFFECTS ON ELECTROSTATIC RF MEMS TUNABLE FILTERS**  
X. Liu<sup>1</sup>, K. Chen<sup>1</sup>, L.P.B. Katehi<sup>2</sup>, W.J. Chappell<sup>1</sup>, and D. Peroulis<sup>1</sup>  
<sup>1</sup>*Purdue University, USA* and <sup>2</sup>*University of California, Davis, USA*
- 151-W TEMPERATURE COMPENSATED SINGLE-DEVICE ELECTROMECHANICAL OSCILLATORS**  
A. Hajjam, A. Rahafrooz, and S. Pourkamali  
*University of Denver, USA*



**152-Th TUNABLE CAPACITOR SERIES/SHUNT DESIGN FOR INTEGRATED TUNABLE WIRELESS FRONT END APPLICATIONS**

D.R. DeReus, S. Natarajan, S.J. Cunningham, and A.S. Morris  
*Wispry, Inc., USA*

**BIO AND CHEMICAL MICRO SENSORS AND SYSTEMS**

**153-M 3D SOLENOIDAL MICROCOIL ARRAYS WITH CMOS INTEGRATED AMPLIFIERS FOR PARALLEL MR IMAGING AND SPECTROSCOPY**

V. Badilita<sup>1</sup>, K. Kratt<sup>1</sup>, N. Baxan<sup>2</sup>, J. Anders<sup>3</sup>, D. Elverfeld<sup>2</sup>, G. Boero<sup>3</sup>, J. Hennig<sup>2</sup>, J.G. Korvink<sup>1</sup>, and U. Wallrabe<sup>1</sup>

<sup>1</sup>*University of Freiburg - IMTEK, GERMANY*, <sup>2</sup>*University Hospital Freiburg, GERMANY*, and <sup>3</sup>*Ecole Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND*

**154-T A LOW-MASS HIGH-SPEED  $\mu$ GC SEPARATION COLUMN WITH BUILT-IN FLUIDIC CHIP-TO-CHIP INTERCONNECTS**

K.T.M. Beach, S.M. Reidy, R.J.M. Gordonker, and K.D. Wise  
*University of Michigan, USA*

**155-W A MEMS BASED GRAVIMETRIC RESONATOR FOR MASS SENSING APPLICATIONS**

E. Bayraktar<sup>1</sup>, D. Eroglu<sup>1</sup>, A.T. Ciftlik<sup>2</sup>, and H. Kulah<sup>1</sup>

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**156-Th A MEMS DIFFERENTIAL SCANNING CALORIMETER FOR THERMODYNAMIC CHARACTERIZATION OF BIOMOLECULES**

B. Wang and Q. Lin  
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**157-M MICROFABRICATED INTEGRATED SAMPLER-INJECTOR (MISI) FOR MICRO GAS CHROMATOGRAPHY**

J.H. Seo, S.K. Kim, E.T. Zellers, and K. Kurabayashi  
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S. Khoshfetrat Pakazad<sup>1</sup>, A.M. Savov<sup>2</sup>, A. van de Stolpe<sup>3</sup>, S. Braam<sup>4</sup>, B. van Meer<sup>1</sup>, and R. Dekker<sup>1</sup>  
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**159-W AN ELECTROCHEMICAL-CANTILEVER PLATFORM FOR HYBRID SENSING APPLICATIONS**

L.M. Fischer, S. Dohn, A. Boisen, and M. Tenje  
*Technical University of Denmark, DENMARK*

**160-Th AN ELECTRODYANMIC PRECONCENTRATOR-INTEGRATED THERMOELECTRIC BIOSENSOR CHIP FOR CONTINUOUS MONITORING**

Y.-H. Choi, D.-H. Kang, S.-I. Yoon, M.-G. Kim, J. Sim, J. Kim, and Y.-J. Kim  
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C.-H. Wang, K.-Y. Lien, L.-Y. Hung, H.-Y. Lei, and G.-B. Lee  
*National Cheng Kung University, TAIWAN*

- 162-T BIOFILMS IN HYDROGEL CORE-SHELL FIBERS**  
K. Hirayama<sup>1</sup>, D. Kiriya<sup>1,2</sup>, H. Onoe<sup>1,2</sup>, and S. Takeuchi<sup>1,2</sup>  
*<sup>1</sup>University of Tokyo, JAPAN and <sup>2</sup>Japan Science and Technology Agency (JST), JAPAN*
- 163-W DYNAMIC STATES OF ADHERING CANCER CELLS UNDER SHEAR FLOW IN AN ANTIBODY-FUNCTIONALIZED MICROCHANNEL**  
X.J. Zheng, L.S.L. Cheung, L. Jiang, J.A. Schroeder, R.L. Heimark, J.C. Baygents, R. Guzman, and Y. Zohar  
*University of Arizona, USA*
- 164-Th EFFECT OF POLYMER THICKNESS ON THE CHEMICAL SENSING BEHAVIOR OF POLYMER-COATED MASS-SENSITIVE DISK RESONATORS**  
S. Truax<sup>1</sup>, K.S. Demirel<sup>1,2</sup>, L. Beardslee<sup>1</sup>, Y. Luzinova<sup>3</sup>, B. Mizaikoff<sup>4</sup>, A. Hierlemann<sup>5</sup>, and O. Brand<sup>1</sup>  
*<sup>1</sup>Georgia Institute of Technology, USA, <sup>2</sup>Texas Instruments, USA, <sup>3</sup>Center for Disease Control and Prevention, USA, <sup>4</sup>Ulm University, GERMANY, and <sup>5</sup>ETH Zurich, SWITZERLAND*
- 165-M ELECTROSTATIC SWITCHING BIOSENSOR – A NOVEL LABEL-FREE DNA DETECTION USING AN ELECTRODE CHARGING TECHNIQUE**  
S.-U. Hwang, J.-M. Choi, H.-H. Yang, C.-H. Kim, C. Jung, H.G. Park, Y.-K. Choi, and J.-B. Yoon  
*Korea Advanced Institute of Science and Technology (KAIST), SOUTH KOREA*
- 166-T FABRICATION OF BIOPROBE INTEGRATED WITH HOLLOW NANONEEDLE FOR CELLULAR FUNCTION ANALYSIS**  
T. Shibata<sup>1</sup>, N. Kato<sup>1</sup>, S. Horiike<sup>1</sup>, T. Kawashima<sup>1</sup>, M. Nagai<sup>1</sup>, T. Mineta<sup>2</sup>, and E. Makino<sup>3</sup>  
*<sup>1</sup>Toyohashi University of Technology, JAPAN, <sup>2</sup>Yamagata University, JAPAN, and <sup>3</sup>Hirosaki University, JAPAN*
- 167-W FAST PCR UTILIZING BUOYANT CONVECTION IN A DISPOSABLE CHIP**  
K.H. Chung, Y.H. Choi, B.K. Kim, and G.Y. Sung  
*Electronics and Telecommunications Research Institute (ETRI), SOUTH KOREA*
- 168-Th FORMATION OF SELF-ACTUATING LIPID TUBES USING MICROFABRICATED PICOLITER NOZZLE ARRAY**  
M. Masubuchi<sup>1</sup>, T. Toyota<sup>1,2</sup>, M. Yamada<sup>1</sup>, and M. Seki<sup>1</sup>  
*<sup>1</sup>Chiba University, JAPAN and <sup>2</sup>University of Tokyo, JAPAN*
- 169-M FUNCTIONALIZED MESOPOROUS THIN-FILM DIRECTLY SELF-ASSEMBLED ON RESONANT-CANTILEVERS FOR BATCH-PRODUCIBLE CHEMICAL SENSORS**  
H.T. Yu, P.C. Xu, T.G. Xu, and X. Li  
*Chinese Academy of Sciences, CHINA*
- 170-T HIGH-THROUGHPUT AUTOMATED SYSTEM FOR STATISTICAL BIOSENSING EMPLOYING MICROCANTILEVER ARRAYS**  
F.G. Bosco<sup>1</sup>, C.H. Chen<sup>2</sup>, E.T. Hwu<sup>2</sup>, M. Bache<sup>1</sup>, S. Keller<sup>1</sup>, and A. Boisen<sup>1</sup>  
*<sup>1</sup>Technical University of Denmark, DENMARK and <sup>2</sup>Academia Sinica, TAIWAN*
- 171-W HIGH-THROUGHPUT SINGLE-CELL PATHOGEN DETECTION ON A DROPLET MICROFLUIDIC PLATFORM**  
T.D. Rane<sup>1</sup>, H. Zec<sup>1</sup>, C. Puleo<sup>1</sup>, A.P. Lee<sup>2</sup>, and T.-H. Wang<sup>1</sup>  
*<sup>1</sup>Johns Hopkins University, USA and <sup>2</sup>University of California, Irvine, USA*
- 172-Th SIMPLE MOLDING FABRICATION FOR POLYACRYLAMIDE HYDROGEL**  
H. Shibata<sup>1,3</sup>, Y.J. Heo<sup>1,2</sup>, and S. Takeuchi<sup>1,2</sup>  
*<sup>1</sup>BEANS (Bio Electromechanical Autonomous Nano Systems), JAPAN, <sup>2</sup>University of Tokyo, JAPAN, and <sup>3</sup>Terumo Co., JAPAN*

- 173-M HYDROGEN-BOND-BASED LATERAL INTER-MOLECULAR EFFECT ON SURFACE-STRESS GENERATION FOR CANTILEVER SENSORS**  
T.T. Yang, Y. Chen, P.C. Xu, and X.X. Li  
*Chinese Academy of Sciences, CHINA*
- 174-T AN INTEGRATED MECHANOSTIMULATION SYSTEM FOR PROBING ARCHITECTURE BASED CALCIUM SIGNALING IN HUVEC CELLS**  
M. Junkin, Y. Lu, P. Deymier, and P.K. Wong  
*University of Arizona, USA*
- 175-W INTEGRATED TOTAL-NO<sub>x</sub>-EVALUATION-CHIP FOR SIMULTANEOUS CONVERSION AND DETECTION OF NO<sub>x</sub> IN AIR**  
S.-I. Yoon, H.-R. Ahn, J. Yoon, S. Song, and Y.-J. Kim  
*Yonsei University, SOUTH KOREA*
- 176-Th LABEL FREE PIEZOELECTRIC DNA SENSOR ARRAY BY SELECTIVE IMMOBILIZATION VIA ELECTROCHEMICAL METHOD**  
P. Kao, D. Allara, and S. Tadigadapa  
*Pennsylvania State University, USA*
- 177-M LABEL-FREE ADHESION-BASED CELL SORTER USING OPTIMIZED OBLIQUE GROOVES FOR EARLY CANCER DETECTION**  
N.H. Chen, U. Tomita, N. Kasagi, T. Nagamune, and Y. Suzuki  
*University of Tokyo, JAPAN*
- 178-T LIVING CELL FABRIC**  
H. Onoe<sup>1,2</sup>, R. Gojo<sup>1,2</sup>, Y. Matsunaga<sup>1,2</sup>, D. Kiriya<sup>1,2</sup>, M. Kato-Negishi<sup>1</sup>, K. Kuribayashi-Shigetomi<sup>1,2</sup>, Y. Shimoyama<sup>1</sup>, and S. Takeuchi<sup>1,2</sup>  
<sup>1</sup>*University of Tokyo, JAPAN and* <sup>2</sup>*Japan Science and Technology Agency (JST), JAPAN*
- 179-W LOW COST MICRO-PLATFORM FOR CULTURING AND STIMULATION OF CARDIOMYOCYTE TISSUE**  
L. Oropeza-Ramos<sup>1</sup>, A. Macías<sup>1</sup>, S. Juárez<sup>2</sup>, A. Falcón<sup>1</sup>, A. Torres<sup>1</sup>, M. Hautefeuille<sup>1</sup>, and H. González<sup>1</sup>  
<sup>1</sup>*Universidad Nacional Autónoma de México, MEXICO and* <sup>2</sup>*Instituto Politécnico Nacional, MEXICO*
- 180-Th LOW PRESSURE DROP MICRO PRECONCENTRATORS WITH COBWEB TENAX-TA FILM FOR ANALYSIS OF HUMAN BREATH**  
B. Alfeeli<sup>1,2</sup>, H. Vereb<sup>1</sup>, A. Dietrich<sup>1</sup>, and M. Agah<sup>1</sup>  
<sup>1</sup>*Virginia Tech, USA and* <sup>2</sup>*Kuwait Institute for Scientific Research Scientific, KUWAIT*
- 181-M MEMS BIOSENSOR FOR PARALLEL AND HIGHLY SENSITIVE AND SPECIFIC DETECTION OF HEPATITIS**  
H. Urey<sup>1</sup>, E. Timurdogan<sup>1,2</sup>, E. Ermek<sup>1</sup>, I.H. Kavakli<sup>1</sup>, and B.E. Alaca<sup>1</sup>  
<sup>1</sup>*Koc University, TURKEY and* <sup>2</sup>*Massachusetts Institute of Technology, USA*
- 182-T MEMS-ENABLED MULTI-UNIT NEURAL RECORDING FROM DROSOPHILA MELANOGASTER**  
O.H. Paydar, A. Chung, D. Niknam, A.O. Fung, B. Matthews, J.W. Judy, M.A. Frye, and D. Markovic  
*University of California, Los Angeles, USA*
- 183-W MICRO BEAD TYPE TEMPERATURE SENSOR WITH RATIOMETRIC FLUORESCENCE DYES ENCAPSULATED BY PARYLENE**  
H. Aoki, T. Kan, N. Binh-Khiem, K. Matsumoto, and I. Shimoyama  
*University of Tokyo, JAPAN*

- 184-Th MICROFLUIDIC ORIGAMI FOR POINT-OF-CARE EXTRACTION OF NUCLEIC ACIDS FROM VISCOUS SAMPLES**  
A.V. Govindarajan, S. Ramachandran, G.D. Vigil, P. Yager, and K.F. Böhringer  
*University of Washington, USA*
- 185-M MICROFLUIDIC PING PONG FOR CYTOKINE DETECTION**  
R.D. Sochol<sup>1</sup>, L. Lo<sup>1</sup>, R. Ruelos<sup>1</sup>, V. Chang<sup>1</sup>, D. Bahri<sup>1</sup>, K. Iwai<sup>1</sup>, J.C. Lo<sup>2</sup>, M. Dueck<sup>1</sup>, L.P. Lee<sup>1</sup>, and L. Lin<sup>1</sup>  
<sup>1</sup>*University of California, Berkeley, USA* and <sup>2</sup>*Sandia National Laboratories, USA*
- 186-T MONITORING IMPULSIONAL PH VARIATIONS IN MICROVOLUMES: A NEW APPROACH FOR THE ELECTROCHEMICAL DETECTION**  
A.K. Diallo<sup>1,2</sup>, L. Mazonq<sup>1,2</sup>, L. Djeghlaf<sup>1,2</sup>, J. Launay<sup>1,2</sup>, W. Sant<sup>3</sup>, and P. Temple-Boyer<sup>1,2</sup>  
<sup>1</sup>*CNRS-LAAS, FRANCE*, <sup>2</sup>*Université de Toulouse, FRANCE*, and <sup>3</sup>*HEMODIA Company, FRANCE*
- 187-W NANOFLUIDIC CARBON-DIOXIDE SENSOR USING NANOSCALE HYDRONIUM-DOMINATED ION TRANSPORT THEORY**  
A.M. Crumrine<sup>1</sup>, D. Shah<sup>1</sup>, M.B. Andersen<sup>2</sup>, H. Bruus<sup>2</sup>, and S. Pennathur<sup>1</sup>  
<sup>1</sup>*University of California, Santa Barbara, USA* and <sup>2</sup>*Technical University of Denmark, DENMARK*
- 188-Th NOVEL TYPE OF MICROCANTILEVER BIOSENSOR RESONATING AT THE INTERFACE BETWEEN LIQUID AND AIR**  
J. Park, S. Nishida, H. Kawakatsu, and H. Fujita  
*University of Tokyo, JAPAN*
- 189-M POROUS MICROFLUIDICS: A UNIQUE PLATFORM FOR TRANSVASCULAR STUDY**  
H. Borteh, B. Kim, and Y. Zhao  
*Ohio State University, USA*
- 190-T REAL-TIME MONITORING OF CA<sup>2+</sup> CONCENTRATION IN PANCREATIC BETA CELLS BY A MICROFLUIDIC DEVICE INTEGRATED WITH TOTAL INTERNAL REFLECTION (TIR)-BASED CHIP**  
Y. Kitazawa<sup>1,2</sup>, R. Yokokawa<sup>1,2</sup>, K. Terao<sup>2,3</sup>, A. Okonogi<sup>1,2</sup>, D.V. Dao<sup>4</sup>, S. Sugiyama<sup>4</sup>, I. Kanno<sup>1</sup>, and H. Kotera<sup>1,2</sup>  
<sup>1</sup>*Kyoto University, JAPAN*, <sup>2</sup>*Japan Science and Technology Agency (JST), JAPAN*, <sup>3</sup>*Kagawa University, JAPAN*, and <sup>4</sup>*Ritsumeikan University, JAPAN*
- 191-W REDUCED VISCOUS DAMPING IN HIGH FREQUENCY PIEZOELECTRIC RESONANT NANOCHANNELS FOR SENSING IN FLUIDS**  
C. Zuniga, M. Rinaldi, and G. Piazza  
*University of Pennsylvania, USA*
- 192-Th SELECTIVITY ENHANCEMENT STRATEGY FOR CANTILEVER-BASED GAS-PHASE VOC SENSORS THROUGH USE OF PEPTIDE-FUNCTIONALIZED CARBON NANOTUBES**  
L.A. Beardslee<sup>1</sup>, S. Truax<sup>1</sup>, J.H. Lee<sup>1</sup>, S. Pavlidis<sup>1</sup>, P. Hesketh<sup>1</sup>, K.M. Hansen<sup>2</sup>, R. Kramer<sup>3</sup>, and O. Brand<sup>1</sup>  
<sup>1</sup>*Georgia Institute of Technology, USA*, <sup>2</sup>*University of Dayton, USA*, and <sup>3</sup>*Wright Patterson Air Force Base, USA*
- 193-M SILICON NANOPILLAR-FOREST BASED MICROFLUIDIC SURFACE-ENHANCED RAMAN SCATTERING DEVICES**  
H.Y. Mao, W.G. Wu, Y.L. Zhang, P.P. Lv, C. Qian, J. Xu, and H.X. Zhang  
*Peking University, CHINA*
- 194-T SILICON ULTRASONIC MICROPROBES WITH COLLOCATED AND CONCURRENT STRAIN AND BIO-ELECTRICAL POTENTIAL WIRELESS TRANSMISSION**  
C.J. Shen, R.F. Gilmour, Jr., and A. Lal  
*Cornell University, USA*

- 195-W SS-DNA FUNCTIONALIZED ARRAY OF ALN CONTOUR-MODE NEMS RESONANT SENSORS WITH SINGLE CMOS MULTIPLEXED OSCILLATOR FOR SUB-PPB DETECTION OF VOLATILE ORGANIC CHEMICALS**  
M. Rinaldi, C. Zuniga, and G. Piazza  
*University of Pennsylvania, USA*
- 196-Th SYNTHESIS OF <sup>18</sup>F-LABELED PROBES ON EWOD PLATFORM FOR POSITRON EMISSION TOMOGRAPHY (PET) PRECLINICAL IMAGING**  
S. Chen, P.Y. Keng, R.M. van Dam, and C.-J. Kim  
*University of California, Los Angeles, USA*
- 197-M TRACE EXPLOSIVES DETECTION BY MICRO DIFFERENTIAL THERMAL ANALYSIS**  
J. Olsen<sup>1</sup>, L. Senesac<sup>2</sup>, T. Thundat<sup>3</sup>, and A. Boisen<sup>1</sup>  
<sup>1</sup>*Technical University of Denmark, DENMARK*, <sup>2</sup>*Oak Ridge National Laboratory, USA*, and <sup>3</sup>*University of Alberta, CANADA*
- 198-T VERSATILE MICROFLUIDIC GENERATION OF CHEMICAL CONCENTRATION GRADIENTS IN A FLOW-FREE SETTING**  
Y. Zhou and Q. Lin  
*Columbia University, USA*
- 199-W WEIGHING NANOPARTICLES AND VIRUSES USING SUSPENDED NANOCHANNEL RESONATORS**  
J. Lee<sup>1</sup>, G. Chen<sup>2</sup>, W. Shen<sup>3</sup>, K. Payer<sup>1</sup>, T.P. Burg<sup>4</sup>, W. Rodriguez<sup>2,5</sup>, M. Toner<sup>2</sup>, and S.R. Manalis<sup>1</sup>  
<sup>1</sup>*Massachusetts Institute of Technology, USA*, <sup>2</sup>*Massachusetts General Hospital, USA*, <sup>3</sup>*Innovative Micro Technology, USA*, <sup>4</sup>*Max Planck Institute, GERMANY*, and <sup>5</sup>*Daktari Diagnostics, USA*

## **MEDICAL MICROSYSTEMS**

- 200-Th A 3D IMPLANTABLE MICROSYSTEM FOR INTRAOCULAR PRESSURE MONITORING USING A GLASS-IN-SILICON REFLOW PROCESS**  
R.M. Haque and K.D. Wise  
*University of Michigan, USA*
- 201-M A CONFOCAL FIBER OPTIC CATHETER FOR IN VIVO THICKNESS MEASUREMENT OF BIOLOGICAL TISSUES**  
H. Mansoor<sup>1</sup>, H. Zeng<sup>2</sup>, and M. Chiao<sup>1</sup>  
<sup>1</sup>*University of British Columbia, CANADA* and <sup>2</sup>*British Columbia Cancer Research Centre, CANADA*
- 202-T A NOVEL PLATINUM NANOWIRE-COATED NEURAL ELECTRODE AND ITS ELECTROCHEMICAL AND BIOLOGICAL CHARACTERIZATION**  
Y.-H. Jin<sup>1</sup>, P. Daubinger<sup>1</sup>, B.L. Fiebich<sup>2,3</sup>, and T. Stieglitz<sup>1</sup>  
<sup>1</sup>*University of Freiburg - IMTEK, GERMANY*, <sup>2</sup>*University of Freiburg Medical Center, GERMANY* and <sup>3</sup>*VivaCell Biotechnology GmbH, GERMANY*
- 203-W A PARYLENE-BASED MICROELECTRODE ARRAY IMPLANT FOR SPINAL CORD STIMULATION IN RATS**  
M.S. Nandra<sup>1</sup>, I.A. Lavrov<sup>2</sup>, V.R. Edgerton<sup>2</sup>, and Y.-C. Tai<sup>1</sup>  
<sup>1</sup>*California Institute of Technology, USA* and <sup>2</sup>*University of California, Los Angeles, USA*
- 204-Th A PENETRATING MICRO-SCALE DIAMETER PROBE ARRAY FOR IN VIVO NEURON SPIKE RECORDINGS**  
A. Fujishiro<sup>1</sup>, H. Kaneko<sup>2</sup>, T. Kawashima<sup>1</sup>, M. Ishida<sup>1</sup>, and T. Kawano<sup>1</sup>  
<sup>1</sup>*Toyohashi University of Technology, JAPAN* and <sup>2</sup>*National Institute of Advanced Industrial Science and Technology (AIST), JAPAN*

- 205-M A VERTICAL MICRO-SCALE LIGHT GUIDING SILICON DIOXIDE TUBE ARRAY FOR OPTICAL NEUROSTIMULATOR**  
M. Sakata, A. Goryu, A. Ikedo, T. Harimoto, M. Ishida, and T. Kawano  
*Toyohashi University of Technology, JAPAN*
- 206-T A WIRELESS IMPLANTABLE DRUG DELIVERY DEVICE WITH HYDROGEL MICROVALVES CONTROLLED BY FIELD-FREQUENCY TUNING**  
S. Rahimi and K. Takahata  
*University of British Columbia, CANADA*
- 207-W AN IMPLANTABLE BIPOLAR SPINE STIMULATION PROBE WITH BIO-INSPIRED ADHESIVE MICROTUBES**  
C.-T. Wu, L. Ting, Y.-C. Tsai, W.-T. Lin, T.-C. Chen, W.-P. Shih, and C.-W. Lin  
*National Taiwan University, TAIWAN*
- 208-Th ARRAYS OF SOLVENT CAST HOLLOW OUT-OF-PLANE POLYMER MICRONEEDLES FOR DRUG DELIVERY**  
I. Mansoor, U.O. Häfeli, and B. Stoeber  
*University of British Columbia, CANADA*
- 209-M FABRICATION AND TESTING OF A LARGE AREA, HIGH DENSITY, PARYLENE MEMS  $\mu$ ECOG ARRAY**  
P. Ledochowitsch<sup>1</sup>, R.J. Félus<sup>2</sup>, R.R. Gibboni<sup>1</sup>, A. Miyakawa<sup>1</sup>, S. Bao<sup>1</sup>, and M.M. Maharbiz<sup>1</sup>  
<sup>1</sup>*University of California, Berkeley, USA and* <sup>2</sup>*Grenoble INP - PHELMMA, FRANCE*
- 210-T HIGH-DENSITY PMUT ARRAY FOR 3-D ULTRASONIC IMAGING BASED ON REVERSE-BONDING STRUCTURE**  
Y.-F. Wang, T.-L. Ren, Y. Yang, H. Chen, C.-J. Zhou, L.-G. Wang, and L.-T. Liu  
*Tsinghua University, CHINA*
- 211-W HYPODERMIC-NEEDLE-LIKE HOLLOW POLYMER MICRONEEDLE ARRAY USING UV LITHOGRAPHY INTO MICROMOLDS**  
P.-C. Wang, S.-J. Paik, J. Kim, S.-H. Kim, and M.G. Allen  
*Georgia Institute of Technology, USA*
- 212-M MULTI-ELECTRODE STYLES WITH NOVEL SIDEWALL ELECTRODE ON GLASS MICROPROBE IMPLEMENTED BY SI-VIA STRUCTURE**  
Y.-T. Lee, Y.-C. Chang, and W. Fang  
*National Tsing Hua University, TAIWAN*
- 213-T MULTI-LAYER SIGNAL ENCODED TISSUE CULTURE DEVICE FORMED OF NANO-FIBROUS MICROCAPSULES**  
R. Tane<sup>1</sup>, M. Ikeuchi<sup>2</sup>, and K. Ikuta<sup>2</sup>  
<sup>1</sup>*Nagoya University, JAPAN and* <sup>2</sup>*University of Tokyo, JAPAN*
- 214-W NEURAL PROBES INTEGRATED WITH OPTICAL MIXER/SPLITTER WAVEGUIDES AND MULTIPLE STIMULATION SITES**  
M. Im<sup>1</sup>, I.-J. Cho<sup>1,2</sup>, F. Wu<sup>1</sup>, K.D. Wise<sup>1</sup>, and E. Yoon<sup>1</sup>  
<sup>1</sup>*University of Michigan, USA and* <sup>2</sup>*Korea Institute of Science and Technology (KIST), SOUTH KOREA*
- 215-Th PHOTOTHERMAL NANOBLADE FOR SINGLE CELL SURGERY**  
T.-H. Wu, T. Teslaa, M.A. Teitell, and P.-Y. Chiou  
*University of California, Los Angeles, USA*
- 216-M TOWARDS A MICROFLUIDIC DISPENSER CHIP FOR PRINTING OF SINGLE-CELLS**  
A. Yusof, R. Zengerle, and P. Koltay  
*University of Freiburg - IMTEK, GERMANY*

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- 217-T 5-INCH-SIZE CONTACTLESS GRIPPER USING ARRAYED SPIRAL AIR FLOWS**  
K. Morimoto<sup>1</sup>, Y. Tada<sup>1</sup>, H. Takashima<sup>2</sup>, K. Minamino<sup>2</sup>, R. Tahara<sup>2</sup>, and S. Konishi<sup>1</sup>  
<sup>1</sup>Ritsumeikan University, JAPAN and <sup>2</sup>Murata Machinery, Ltd., JAPAN
- 218-W A BISTABLE SHAPE MEMORY MICROVALVE**  
J. Barth, C. Megnin, and M. Kohl  
Karlsruher Institute of Technology, GERMANY
- 219-Th HIGHLY EFFICIENT THREE DIMENSIONAL (3D) LIQUID-LIQUID WAVEGUIDE LASER BY TWO FLOW STREAMS**  
Y. Yang, C.D. Ohl, H.S. Yoon, and A.Q. Liu  
Nanyang Technological University, SINGAPORE
- 220-M A HIGH-THROUGHPUT MICROFLUIDIC CHIP FOR SIZE SORTING OF CELLS**  
X. Tan<sup>1</sup>, H.-J. Yoon<sup>2</sup>, J. Granneman<sup>1</sup>, H.-P. Moore<sup>2</sup>, and M.M.-C Cheng<sup>1</sup>  
<sup>1</sup>Wayne State University, USA and <sup>2</sup>Lawrence Technological University, USA
- 221-T A MICROFLUIDIC INDUCTIVE PULSE SENSOR FOR REAL TIME DETECTION OF MACHINE WEAR**  
L. Du and J. Zhe  
University of Akron, USA
- 222-W A PERISTALTIC MICROPUMP USING TRAVELING WAVES OF POLYMER MEMBRANES DRIVEN BY A SINGLE ACTUATOR**  
K. Nakahara, K. Yoshimura, Y. Okayama, and N. Miki  
Keio University, JAPAN
- 223-Th A SEAMLESSLY INTEGRATED MICROFLUIDIC PRESSURE SENSOR BASED ON AN IONIC LIQUID ELECTROFLUIDIC CIRCUIT**  
C.-Y. Wu, W.-H. Liao, and Y.-C. Tung  
Academia Sinica, TAIWAN
- 224-M A SIMPLE ALL-PARYLENE IN-CHANNEL POP-UP CHECKVALVE WITH CONTROLLABLE CRACKING PRESSURE**  
J.C.-H. Lin, C.D. Kang, and Y.-C. Tai  
California Institute of Technology, USA
- 225-T A SINGLE-STAGE MICROMACHINED VACUUM PUMP ACHIEVING 164 TORR ABSOLUTE PRESSURE**  
H. Zhou, H.Q. Li, V. Sharma, and M.A. Schmidt  
Massachusetts Institute of Technology, USA
- 226-W ACTIVE VIRUS FILTER FOR ENRICHMENT AND MANIPULATION OF VIRUS**  
T. Masuda<sup>1</sup>, H. Maruyama<sup>1</sup>, A. Honda<sup>2</sup>, and F. Arai<sup>1</sup>  
<sup>1</sup>Nagoya University, JAPAN and <sup>2</sup>Hosei University, JAPAN
- 227-Th AN ALL-IN-ONE NANOREACTOR FOR HIGH-RESOLUTION MICROSCOPY ON NANOMATERIALS AT HIGH PRESSURES**  
J.F. Creemer<sup>1</sup>, F. Santagata<sup>1</sup>, B. Morana<sup>1</sup>, L. Mele<sup>1</sup>, T. Alan<sup>1</sup>, E. Iervolino<sup>1,2</sup>, G. Pandraud<sup>1</sup>, and P.M. Sarro<sup>1</sup>  
<sup>1</sup>Technical University Delft, THE NETHERLANDS and <sup>2</sup>Xensor Integration BV, THE NETHERLANDS
- 228-M CENTRIFUGO-MAGNETOPHORETIC SEPARATION AND ROUTING OF PARTICLES**  
J. Siegrist, L. Zavattoni, and J. Ducreé  
Dublin City University, IRELAND

- 229-T DRIVING MULTILAYER PDMS BASED PERISTALTIC PUMP WITH LASER PULSES**  
Y. Chen, T.-H. Wu, and P.-Y. Chiou  
*University of California, Los Angeles, USA*
- 230-W ELECTRICAL CONTROL OF DROPLET DIRECTION WITH PHASE-VARIED FRESNEL LENS ON ACOUSTIC WAVE LIQUID EJECTOR**  
L. Wang, Y. Choe, and E.S. Kim  
*University of Southern California, USA*
- 231-Th ELECTRODEFORMATION FOR SINGLE CELL MECHANICAL CHARACTERIZATION**  
J. Chen, M. Abdelgawad, L. Yu, N. Shakiba, W.-Y. Chien, Z. Lu, W.B. Geddie, M.A.S. Jewett, and Y. Sun  
*University of Toronto, CANADA*
- 232-M FABRICATION AND CHARACTERIZATION OF PARYLENE C-CAULKED PDMS FOR LOW-PERMEABLE MICROFLUIDICS**  
Y.H. Lei, Y.P. Liu, W. Wang, W.G. Wu, and Z.H. Li  
*Peking University, CHINA*
- 233-T BUBBLE-BASED DROPLET MIXERS MICROFLUIDIC SYSTEMS**  
Z.G. Li<sup>1</sup>, C.D. Ohl<sup>1</sup>, K. Ando<sup>1</sup>, J.B. Zhang<sup>2</sup>, and A.Q. Liu<sup>1</sup>  
<sup>1</sup>*Nanyang Technological University, SINGAPORE and*  
<sup>2</sup>*Agency for Science, Technology and Research (A\*STAR), SINGAPORE*
- 234-W FINGER-POWERED, PRESSURE-DRIVEN MICROFLUIDIC PUMP**  
K. Iwai, R.D. Sochol, and L. Lin  
*University of California, Berkeley, USA*
- 235-Th FULLY INTEGRATED MICRO CORIOLIS MASS FLOW SENSOR OPERATING AT ATMOSPHERIC PRESSURE**  
R.J. Wiegerink<sup>1</sup>, T.S.J. Lammerink<sup>1</sup>, J. Haneveld<sup>1</sup>, T.A.G. Hageman<sup>1</sup>, and J.C. Lötters<sup>1,2</sup>  
<sup>1</sup>*University of Twente, THE NETHERLANDS and* <sup>2</sup>*Bronkhorst High-Tech, THE NETHERLANDS*
- 236-M HIGH PRESSURE PUMP AS LAB ON CHIP COMPONENT FOR MICRO-FLUIDIC INTEGRATED SYSTEM**  
M. Hiraoka<sup>1,2</sup>, P. Fiorini<sup>2</sup>, I. Yamashita<sup>1</sup>, C. Van Hoof<sup>2</sup>, and M. Op de Beek<sup>2</sup>  
<sup>1</sup>*Panasonic Corp., JAPAN and* <sup>2</sup>*IMEC, BELGIUM*
- 237-T HIGHLY FLEXIBLE, TRANSPARENT AND PATTERNABLE PARYLENE-C SUPERHYDROPHOBIC FILMS WITH HIGH AND LOW ADHESION**  
B. Lu<sup>1</sup>, J.C.-H. Lin<sup>1</sup>, Z. Liu<sup>1</sup>, Y.-K. Lee<sup>2</sup>, and Y.-C. Tai<sup>1</sup>  
<sup>1</sup>*California Institute of Technology, USA, and* <sup>2</sup>*Hong Kong University of Science and Technology, CHINA*
- 238-W INTEGRATION OF HIGH-EFFICIENCY CAPTURE AND MAGNETO-HYDRODYNAMIC RETRIEVAL OF PARTICLES ON A CENTRIFUGAL MICROFLUIDIC PLATFORM**  
R. Burger, P. Reith, P. Abgrall, and J. Ducr e  
*Dublin City University, IRELAND*
- 239-Th MANIPULATION OF MAGNETIC WIRES FOR DROPLET-BASED MICRO-TAS**  
T. Sugito, N. Inagaki, M. Shikida, M. Okochi, H. Honda, and K. Sato  
*Nagoya University, JAPAN*
- 240-M MICRO FLUIDIC CIRCUIT DESIGN WITH "SPICE" SIMULATION**  
H. Takao<sup>1</sup>, M. Sugiura<sup>2</sup>, M. Ishida<sup>2</sup>, K. Terao<sup>1</sup>, T. Suzuki<sup>1</sup>, F. Shimokawa<sup>1</sup>, and F. Oohira<sup>1</sup>  
<sup>1</sup>*Kagawa University, JAPAN and* <sup>2</sup>*Toyohashi University of Technology, JAPAN*



- 241-T MICROFABRICATED PRESSURE SENSING PARTICLES WITH INTEGRATED RETROREFLECTORS**  
S. Chalasani<sup>1,2</sup>, Y. Xie<sup>1</sup>, and C. Mastrangelo<sup>1</sup>  
*<sup>1</sup>University of Utah, USA and <sup>2</sup>Qualcomm, USA*
- 242-W MINIATURE PENNING CELL ARRAY FOR ON-CHIP VACUUM PUMPING**  
S.R. Green and Y.B. Gianchandani  
*University of Michigan, USA*
- 243-Th MOBILE MICRO SCREW PUMP WITH FLOW SENSING CAPABILITY FOR ON-SITE FLOW CONTROL IN MICROCHANNEL DEVICE**  
S. Nakamoto<sup>1</sup>, K. Kobayashi<sup>1</sup>, M. Ikeuchi<sup>2</sup>, and K. Ikuta<sup>2</sup>  
*<sup>1</sup>Nagoya University, JAPAN and <sup>2</sup>University of Tokyo, JAPAN*
- 244-M MULTIPLEXING OF HIGHLY REPRODUCIBLE, BEAD-BASED IMMUNOASSAYS ON A CENTRIFUGAL MICROFLUIDIC PLATFORM**  
R. Burger, P. Reith, P. Abgrall, G. Kijanka, and J. Ducr e  
*Dublin City University, IRELAND*
- 245-T PROGRAMMED AUTONOMOUS MICROFLUIDICS USING MICROVALVES AND MICROPUMPS**  
K. Kojima and H. Suzuki  
*University of Tsukuba, JAPAN*
- 246-W PROPELLING MICROOBJECTS USING A STATIONARY DC VOLTAGE**  
M. Takinoue<sup>1</sup>, H. Onoe<sup>1</sup>, D. Kiriya<sup>1</sup>, and S. Takeuchi<sup>1,2</sup>  
*<sup>1</sup>University of Tokyo, JAPAN and <sup>2</sup>Japan Science and Technology Agency (JST), JAPAN*
- 247-Th SEPARATION AND MANIPULATION OF MICRO-PARTICLES USING OPTICAL IMAGES ON FLEXIBLE POLYMER DEVICES**  
S.-J. Lin<sup>1</sup>, W. Wang<sup>1</sup>, Y.-H. Lin<sup>2</sup>, B.-C. Yeh<sup>1</sup>, T.-F. Guo<sup>1</sup>, and G.-B. Lee<sup>1</sup>  
*<sup>1</sup>National Cheng Kung University, TAIWAN and <sup>2</sup>Chang Gung University, TAIWAN*
- 248-M RESTORING UNDERWATER SUPERHYDROPHOBICITY WITH SELF-REGULATED GAS GENERATION**  
C. Lee and C.-J. Kim  
*University of California, Los Angeles, USA*
- 249-T SENSOR FOR GAS ANALYSIS BASED ON THERMAL CONDUCTIVITY, SPECIFIC HEAT CAPACITY AND THERMAL DIFFUSIVITY**  
K. Kliche, S. Billat, F. Hedrich, C. Ziegler, and R. Zengerle  
*Institute for Micromachining and Information Technology (HSG-IMIT), GERMANY*
- 250-W SIGNIFICANT BOILING ENHANCEMENT WITH SURFACES COMBINING SUPERHYDROPHILIC AND SUPERHYDROPHOBIC PATTERNS**  
A.R. Betz<sup>1</sup>, J.R. Jenkins<sup>2</sup>, C.-J. Kim<sup>2</sup>, and D. Attinger<sup>1</sup>  
*<sup>1</sup>Columbia University, USA and <sup>2</sup>University of California, Los Angeles, USA*
- 251-Th SIMPLE, HIGH-PRECISION, MICROLITER PER MINUTE, FLUID-FLOW SENSOR**  
J.M. Lippmann<sup>1</sup> and A.P. Pisano<sup>2</sup>  
*<sup>1</sup>State University of New York, Buffalo, USA and <sup>2</sup>University of California, Berkeley, USA*
- 252-M VOLUME CONTROLLED HIGH THROUGHPUT PICOLITER DROPLET GENERATION SYSTEM USING CASCADE MULTI-STAGE SEPARATION CHANNEL**  
M. Fujii<sup>1</sup>, K. Kawai<sup>2</sup>, D.H. Yoon<sup>1</sup>, and S. Shoji<sup>1</sup>  
*<sup>1</sup>Waseda University, JAPAN and <sup>2</sup>Osaka University, JAPAN*

## MICRO-ACTUATORS

- 253-T 2-DOF TWISTING ELECTROTHERMAL ACTUATOR FOR SCANNING LASER RANGEFINDER APPLICATION**  
C. Guo and G.K. Fedder  
*Carnegie Mellon University, USA*
- 254-W A LARGE-DEFLECTION HIGH-FORCE MICRO ELECTROMAGNETIC HYDRAULIC LATEX MEMBRANE ACTUATOR FOR FLUID MANIPULATION IN MICRO CHANNELS**  
J.W. Park, J.-H. Yang, and H. Kim  
*University of Utah, USA*
- 255-Th A LOW-POWER MILLIWATT ELECTROMAGNETIC MICROSPEAKER USING A PDMS MEMBRANE FOR HEARING AIDS APPLICATION**  
Y.C. Chen and Y.T. Cheng  
*National Chiao Tung University, TAIWAN*
- 256-M A NOVEL DFM CANTILEVER WITH TUNING FUNCTION OF RESONANT FREQUENCY FOR BIOMATERIAL IMAGING**  
Y. Hashimoto, I. Hanasaki, and Y. Isono  
*Kobe University, JAPAN*
- 257-T DEVELOPMENT OF UNTETHERED SU-8 POLYMER SCRATCH DRIVE MICROROBOTS**  
M. Valencia, T. Atallah, D. Castro, D. Conchouso, M. Dosari, R. Hammad, E. Rawashdeh, A. Zaher, J. Kosel, and I.G. Foulds  
*King Abdullah University of Science and Technology, SAUDI ARABIA*
- 258-W DIRECTIONAL ACOUSTIC UNDERWATER THRUSTER**  
Z. Wang<sup>1</sup>, J. Zhu<sup>1</sup>, X. Qiu<sup>1</sup>, R. Tang<sup>1</sup>, C. Yu<sup>1</sup>, J. Oiler<sup>1</sup>, E. Kim<sup>2</sup>, and H. Yu<sup>1</sup>  
*<sup>1</sup>Arizona State University, USA and <sup>2</sup>University of Southern California, USA*
- 259-Th FAST AND ROBUST CANTILEVER SWITCH WITH SUPPRESSED BOUNCING FOR IC APPLICATIONS**  
M.-W. Kim, Y.-H. Song, and J.-B. Yoon  
*Korea Advanced Institute of Science and Technology (KAIST), SOUTH KOREA*
- 260-M HIGH EFFICIENCY WIRELESS ELECTROCHEMICAL ACTUATORS: DESIGN, FABRICATION AND CHARACTERIZATION BY ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY**  
R. Sheybani and E. Meng  
*University of Southern California, USA*
- 261-W LOW FRICTION LIQUID BEARING MEMS MICROMOTOR**  
M.L. Chan<sup>1</sup>, B. Yoxall<sup>1</sup>, H. Park<sup>1</sup>, Z. Kang<sup>2</sup>, I. Izyumin<sup>2</sup>, J. Chou<sup>2</sup>, M.M. Megens<sup>2</sup>, M.C. Wu<sup>2</sup>, B.E. Boser<sup>2</sup>, and D.A. Horsley<sup>1</sup>  
*<sup>1</sup>University of California, Davis, USA and <sup>2</sup>University of California, Berkeley, USA*
- 262-Th LOW-POWER 3-BIT PIEZOELECTRIC MEMS ANALOG TO DIGITAL CONVERTER**  
R. Proie<sup>1,2</sup>, J.S. Pulskamp<sup>1</sup>, R.G. Polcawich<sup>1</sup>, T. Ivanov<sup>1</sup>, and M. Zaghoul<sup>2</sup>  
*<sup>1</sup>U.S. Army Research Laboratory, USA and <sup>2</sup>George Washington University, USA*
- 263-M MAGNETIC ACTUATOR USING INTERACTION BETWEEN MICRO MAGNETIC ELEMENTS**  
F. Tsumori<sup>1</sup> and J. Brunne<sup>2</sup>  
*<sup>1</sup>Kyushu University, JAPAN and <sup>2</sup>University of Freiburg - IMTEK, GERMANY*

- 264-T MAGNETOSTATIC TORSIONAL ACTUATOR WITH EMBEDDED NICKEL STRUCTURES FOR PURE ROTATION**  
T.-L. Tang, R. Chen, and W. Fang  
*National Tsing Hua University, TAIWAN*
- 265-W MEMS ELECTROLYTIC INCHWORMS FOR MOVABLE NEURAL PROBE APPLICATIONS**  
L. Giacchino and Y.C. Tai  
*California Institute of Technology, USA*
- 266-Th MODAL ANALYSIS AND MODELING OF A FRICTIONLESS ELECTROSTATIC ROTARY STEPPER MICROMOTOR**  
M. Stranczl<sup>1</sup>, E. Sarajlic<sup>2</sup>, G.J.M. Krijnen<sup>3</sup>, H. Fujita<sup>4</sup>, M.A.M. Gijs<sup>1</sup>, and C. Yamahata<sup>1</sup>  
<sup>1</sup>*Ecole Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND*, <sup>2</sup>*SmartTip B.V., THE NETHERLANDS*,  
<sup>3</sup>*University of Twente, THE NETHERLANDS*, and <sup>4</sup>*University of Tokyo, JAPAN*
- 267-M NOVEL ELECTROTHERMALLY ACTUATED MAGNETOSTATIC BISTABLE MICRORELAY FOR TELECOMMUNICATION APPLICATIONS**  
M. Staab and H.F. Schlaak  
*Technische Universität Darmstadt, GERMANY*
- 268-T PIEZOELECTRIC MEMS DEFORMABLE MIRRORS WITH HIGH-DENSITY ACTUATOR ARRAY**  
M. Sato, I. Kanno, H. Kotera, and O. Tabata  
*Kyoto University, JAPAN*
- 269-W SELECTIVE RF WIRELESS CONTROL OF INTEGRATED BULK-MICROMACHINED SHAPE-MEMORY-ALLOY ACTUATORS AND ITS MICROFLUIDIC APPLICATION**  
M.S. Mohamed Ali<sup>1,2</sup>, and K. Takahata<sup>1</sup>  
<sup>1</sup>*University of British Columbia, CANADA* and <sup>2</sup>*Universiti Teknologi Malaysia, MALAYSIA*
- 270-Th SELF-ENGAGING AND DISENGAGING CONDUCTIVE CMOS-MEMS PROBES**  
L.J. Draghi, J.A. Bain, and G.K. Fedder  
*Carnegie Mellon University, USA*
- 271-M TELEOPERATED MUSCLE-POWERED MICRO GRIPPER CONTROLLED BY ELECTROMYOGRAM**  
K. Kabumoto, K. Toyama, T. Hoshino, and K. Morishima  
*Tokyo University of Agriculture and Technology, JAPAN*
- 272-T WAFER-LEVEL MECHANICAL AND ELECTRICAL INTEGRATION OF SMA WIRES TO SILICON MEMS USING ELECTROPLATING**  
D. Clausi<sup>1</sup>, H. Gradin<sup>2</sup>, S. Braun<sup>2</sup>, J. Peirs<sup>1</sup>, D. Reynaerts<sup>1</sup>, G. Stemme<sup>2</sup>, and W. van der Wijngaart<sup>2</sup>  
<sup>1</sup>*Katholieke Universiteit Leuven, BELGIUM* and <sup>2</sup>*Royal Institute of Technology (KTH), SWEDEN*

## **ENERGY HARVESTING AND POWER MEMS**

- 273-W A NOVEL THREE-DIMENSIONAL MICRO SUPERCAPACITOR USING SELF-SUPPORT NANO COMPOSITE MATERIALS**  
C.W. Shen, X.H. Wang, W.F. Zhang, F.Y. Kang, and C. Du  
*Tsinghua University, CHINA*
- 274-Th A SERIES ARRAY OF MICROLITER-SIZED MICROBIAL FUEL CELL**  
S. Choi and J. Chae  
*Arizona State University, USA*

- 275-M AN ENERGY-AUTONOMOUS SELF-TUNABLE PIEZOELECTRIC VIBRATOR ENERGY HARVESTING SYSTEM**  
C. Eichhorn, R. Tchagsim, N. Wilhelm, G. Biancuzzi, and P. Woias  
*University of Freiburg - IMTEK, GERMANY*
- 276-T CELL-TO-ELECTRODE CONTACT STRUCTURES FOR POWER DENSITY ENHANCEMENTS IN MICROBIAL FUEL CELLS**  
S. Inoue<sup>1,2</sup>, E.A. Parra<sup>2</sup>, A. Higa<sup>2</sup>, and L. Lin<sup>2</sup>  
<sup>1</sup>Taiyo Yuden Co., Ltd., JAPAN and <sup>2</sup>University of California, Berkeley, USA
- 277-W DESIGN AND FABRICATION OF A NONLINEAR RESONATOR FOR ULTRA WIDE-BANDWIDTH ENERGY HARVESTING APPLICATIONS**  
A. Hajati<sup>1</sup>, S.P. Bathurst<sup>2</sup>, H.J. Lee<sup>2</sup>, and S.G. Kim<sup>2</sup>  
<sup>1</sup>FUJIFILM Dimatix, USA and <sup>2</sup>Massachusetts Institute of Technology, USA
- 278-Th ELECTRET ENERGY HARVESTING BASED ON FRINGE ELECTRICAL FIELD CHANGE INSIDE TRENCHED FERROELECTRIC**  
T. Takahashi<sup>1</sup>, M. Suzuki<sup>1</sup>, T. Hirata<sup>1</sup>, N. Matsushita<sup>1</sup>, R. Yoneya<sup>1</sup>, J. Onishi<sup>1</sup>, T. Nishida<sup>2</sup>, Y. Yoshikawa<sup>2</sup>, and S. Aoyagi<sup>1</sup>  
<sup>1</sup>Kansai University, JAPAN and <sup>2</sup>ROHM Co., Ltd, JAPAN
- 279-M MEMS-COMPATIBLE HIGH-DENSITY TRENCH CAPACITOR WITH ULTRA-CONFORMAL Cu/SiO<sub>2</sub> LAYERS BY SUPERCRITICAL FLUID DEPOSITION**  
T. Momose<sup>1,2</sup>, H. Yamada<sup>2</sup>, Y. Kitamura<sup>3</sup>, Y. Hattori<sup>3</sup>, Y. Shimogaki<sup>1,2</sup>, and M. Sugiyama<sup>1,2</sup>  
<sup>1</sup>University of Tokyo, JAPAN, <sup>2</sup>BEANS (Bio Electromechanical Autonomous Nano Systems), JAPAN, and <sup>3</sup>DENSO Corporation, JAPAN
- 280-T NANOSTRUCTURED COPPER MICRO-POST WICKS FOR ADVANCED HEAT PIPES**  
Y.S. Nam<sup>1</sup>, S. Sharratt<sup>1</sup>, and Y.S. Ju<sup>1,2</sup>  
<sup>1</sup>University of California, Los Angeles, USA and <sup>2</sup>California NanoSystems Institute (CNSI), USA
- 281-W OPTIMUM DESIGN OF A PIEZOELECTRIC MEMS GENERATOR FOR FLUID-ACTUATED ENERGY HARVESTING**  
I. Kuehne<sup>1</sup>, M. Schreiter<sup>1</sup>, H. Seidel<sup>2</sup>, and A. Frey<sup>1</sup>  
<sup>1</sup>Siemens AG, GERMANY and <sup>2</sup>University of Saarland, GERMANY
- 282-Th PASSIVE FUEL DELIVERY BASED ON HYDROPHOBIC POROUS SILICON FOR MICRO DIRECT METHANOL FUEL CELLS**  
Y.A. Zhou, X.H. Wang, Z.L. Wu, X.M. Wu, and L.T. Liu  
*Tsinghua University, CHINA*
- 283-M ROTATIONAL ENERGY HARVESTER FOR BODY MOTION**  
E. Romero<sup>1</sup>, M.R. Neuman<sup>2</sup>, and R.O. Warrington<sup>2,3</sup>  
<sup>1</sup>University of Turabo, USA, <sup>2</sup>Michigan Technological University, USA, and <sup>3</sup>University of Michigan, USA
- 284-T UNIFORM NAFION<sup>®</sup> COATED HRA ANODE FOR HIGH PERFORMANCE MICRO DMFC**  
Y.-S. Wu<sup>1</sup>, R.-G. Wu<sup>1</sup>, T.-K. Yeh<sup>1</sup>, C.-H. Tsai<sup>1</sup>, and F.-G. Tseng<sup>1,2</sup>  
<sup>1</sup>National Tsing Hua University, TAIWAN and <sup>2</sup>Academia Sinica, TAIWAN

## **NANO-ELECTRO-MECHANICAL DEVICES AND SYSTEMS**

- 285-W 25 SECOND COCAINE SENSING BY MEMBRANE PROTEIN CHANNEL INTEGRATED IN A MICROFLUIDIC DEVICE**  
R. Kawano<sup>1</sup>, T. Osaki<sup>1</sup>, H. Sasaki<sup>1</sup>, M. Takinoue<sup>2</sup>, S. Yoshizawa<sup>2</sup>, and S. Takeuchi<sup>1,2</sup>  
<sup>1</sup>Kanagawa Academy of Science and Technology (KAST), JAPAN and <sup>2</sup>University of Tokyo, JAPAN

- 286-Th A TRENCH-TYPE ANTI-WEAR MICROPROBE WITH NANO-SCALE ELECTRIC CONTACTS FOR AFM LAO LITHOGRAPHY**  
Y.F. Li<sup>1</sup>, Y. Tomizawa<sup>1</sup>, A. Koga<sup>2</sup>, G. Hashiguchi<sup>3</sup>, M. Sugiyama<sup>4</sup>, and H. Fujita<sup>4</sup>  
<sup>1</sup>BEANS (Bio Electromechanical Autonomous Nano Systems), JAPAN, <sup>2</sup>Toshiba Corporation, JAPAN, <sup>3</sup>Shizuoka University, JAPAN, and <sup>4</sup>University of Tokyo, JAPAN
- 287-M AN UNRELEASED MM-WAVE RESONANT BODY TRANSISTOR**  
W. Wang, L.C. Popa, R. Marathe, and D. Weinstein  
*Massachusetts Institute of Technology, USA*
- 288-T CONTROLLED BATCH FABRICATION OF CRYSTALLINE SILICON NANOBEAM-BASED RESONANT STRUCTURES**  
A. Rahafrooz and S. Pourkamali  
*University of Denver, USA*
- 289-W DUAL Q-DOT TRANSPORT ON MICROTUBULE ARRAY WITH POLARITY DEFINED BY NANOTRACKS AND MICROTUBULE MOTILITY CONTROL**  
M. Yokokawa<sup>1,2</sup>, K. Fujimoto<sup>1</sup>, M. Kitamura<sup>1</sup>, R. Yokokawa<sup>1,3</sup>, and H. Kotera<sup>1</sup>  
<sup>1</sup>Kyoto University, JAPAN, <sup>2</sup>Tsukuba University, JAPAN, and <sup>3</sup>Japan Science and Technology Agency (JST), JAPAN
- 290-Th HIGH-PERFORMANCE AND LOW-COST ION SENSITIVE SENSOR ARRAY BASED ON SELF ASSEMBLED GRAPHENE**  
B. Zhang and T. Cui  
*University of Minnesota, USA*
- 291-M NANO-ELECTROMECHANICAL ZERO-DIMENSIONAL FREESTANDING NANOGAP ACTUATOR**  
J.H. Han<sup>1</sup>, N. Yoshimizu<sup>2</sup>, T. Cheng<sup>2</sup>, M. Ziwicki<sup>1</sup>, S.A. Bhawe<sup>2</sup>, A. Lal<sup>2</sup>, and C.H. Lee<sup>1</sup>  
<sup>1</sup>Marquette University, USA and <sup>2</sup>Cornell University, USA
- 292-T NANO-ELECTROMECHANICAL RELAYS WITH DECOUPLED ELECTRODE AND SUSPENSION**  
R. Parsa<sup>1</sup>, M. Shavezipur<sup>2</sup>, W.S. Lee<sup>1</sup>, S. Chong<sup>1</sup>, D. Lee<sup>1</sup>, H.-S.P. Wong<sup>1</sup>, R. Maboudian<sup>2</sup>, and R.T. Howe<sup>1</sup>  
<sup>1</sup>Stanford University, USA and <sup>2</sup>University of California, Berkeley, USA
- 293-W NUMBER OF KINESIN MOLECULES INVOLVED IN A BEAD TRANSPORT MEASURED BY MICROFLUIDICS AND MECHANICAL MODELING**  
R. Yokokawa<sup>1,2</sup>, Y. Sakai<sup>1</sup>, A. Okonogi<sup>1</sup>, I. Kanno<sup>1</sup>, and H. Kotera<sup>1</sup>  
<sup>1</sup>Kyoto University, JAPAN and <sup>2</sup>Japan Science and Technology Agency (JST), JAPAN
- 294-Th POLYANILINE NANOFIBER GAS SENSORS BY DIRECT-WRITE ELECTROSPINNING**  
D. Chen<sup>1,2</sup>, X. Guo<sup>1,2</sup>, Z. Wang<sup>1</sup>, P. Wang<sup>1</sup>, Y. Chen<sup>2</sup>, and L. Lin<sup>1</sup>  
<sup>1</sup>University of California, Berkeley, USA, and <sup>2</sup>Zhejiang University, CHINA
- 295-M SELECTIVE KINESIN AND DYNEIN IMMOBILIZATION AND ELECTRICAL MICROTUBULE MANIPULATION FOR BIDIRECTIONAL MICROTUBULE MOTILITY**  
H. Kotake<sup>1</sup>, R. Yokokawa<sup>1,2</sup>, I. Kanno<sup>1</sup>, and H. Kotera<sup>1</sup>  
<sup>1</sup>Kyoto University, JAPAN and <sup>2</sup>Japan Science and Technology Agency (JST), JAPAN
- 296-T SILICON CARBIDE PHONONIC CRYSTAL CAVITIES FOR MICROMECHANICAL RESONATORS**  
M. Ziaei-Moayyed<sup>1</sup>, M.F. Su<sup>2</sup>, C. Reinke<sup>1</sup>, I.F. El-kady<sup>2</sup>, and R.H. Olsson III<sup>1</sup>  
<sup>1</sup>Sandia National Laboratories, USA and <sup>2</sup>University of New Mexico, USA

**297-W VERTICAL INTEGRATION OF ZNO NANOWIRES INTO ASYMMETRIC  
PT/ZNO/TI SCHOTTKY UV PHOTODIODES**

C.-Y.P. Yang and L. Lin  
*University of California, Berkeley, USA*

**REGIONAL OPEN POSTERS**

**298-Th DESIGN, DEVELOPMENT AND TESTING OF A LOW-COST, HIGH SENSITIVITY SYSTEM FOR  
NEURODEGENERATIVE DISEASE DETECTION AND CHARACTERIZATION**

R. Bustamante-Bello, L. Aranzeta-Ojeda, C. Moreno-García, and E. López-Caudana  
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**299-M ELECTROSTATIC RF-MEMS SWITCH ACTUATION TESTING**

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**300-T MICRORESONATOR FOR MASS DETECTION ENHANCEMENT IN LIQUIDS**

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**301-W MULTIPLE THERMAL STIMULATIONS TO CHEMICAL VAPORS DETECTION AND DISTINCTION  
FROM A SINGLE SnO<sub>2</sub> SENSOR**

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**302-Th REINFORCEMENT OF MEMS R&D IN MEXICO**

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**303-M X-BAND MEMS CAPACITIVE SWITCH FABRICATED ON MICROWAVE FRIENDLY SUBSTRATE**

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