THE 22ND INTERNATIONAL CONFERENCE ON SOLID-STATE SENSORS, ACTUATORS AND MICROSYSTEMS

25-29 JUNE

TRANSDUCERS 2023 KYOTO JAPAN

FINAL PROGRAM

GENERAL CHAIR
Satoshi Konishi
Ritsumeikan University

EXECUTIVE PROGRAM CHAIR
Shuji Tanaka
Tohoku University

ORGANIZING COMMITTEE CHAIR
Osamu Tabata
Kyoto University of Advanced Science

SPONSOR

The Institute of Electrical Engineers of Japan

TECHNICAL CO-SPONSOR

MEMS
IEEE MEMS TECHNICAL COMMUNITY

TRANSDUCERS 2023

TABLE OF CONTENTS

TECHNICAL PROGRAM

Garden of irises and water lilies in Kyoto (Image by JFBRUNEAU; AdobeStock).

TECHNICAL PROGRAM INFORMATION

Parallel Oral Sessions

Each day papers will be presented in 4 parallel sessions. There will be a total of 40 oral sessions throughout the 4 days of the Conference.

Poster Sessions

The 3 poster sessions will be held in Event Hall. Posters will be on display from Monday at 10:15 through Wednesday at 16:15. All poster papers are listed with their assigned number and presentation day. Authors will be available for questions during their appointed time.

Guide to Understanding Paper/Session Numbering

Each paper is assigned a unique number which clearly indicates when and where the paper is presented. The number of each paper is shown before the paper title.

Typical Paper Number: **M4B.003**

- The first letter (i.e., **M**) indicates the day of the Conference:

  M = Monday
  T = Tuesday
  W = Wednesday
  Th = Thursday

- The second number (i.e., **4**) indicates what time during the day the session is being presented:

  1 = Early Morning
  2 = Mid Morning
  3 = Early Afternoon
  4 = Late Afternoon

- The third letter (i.e., **B**) shows the room location of the paper:

  A = New Hall
  B = Event Hall
  C = Room A
  D = Room D
  E = Room E
  F = Room B-1
  P = Event Hall

- The number after the point (.) shows the number of the paper in the session in sequence starting at **001** (with the exception of posters).

SUNDAY PROGRAM

25 JUNE

Special Event – Future Visions for Transducers Part I

Session Chair:
Taeko Ando, *Ritsumeikan University, JAPAN*

Event Hall

13:00 – 16:30
Poster Presentation and Workshop

Conference Registration and Check-In

New Hall Foyer

17:00 – 20:00

Welcome Reception

Swan Room and outside in the Garden

18:00 – 20:00

Cherry blossoms at Hokongo-in Temple in Kyoto (Image by Route16; AdobeStock).

MONDAY AT A GLANCE

08:45 – 09:15	Welcome Address and Technical Program Information			
09:15 – 10:00	Plenary Presentation 1 Masayo Takahashi, *Vision Care Inc., JAPAN*			
10:00 – 10:15	2023 Transducers Early Career Award Presentation Recipient – Azadeh Ansari, *Georgia Tech, USA*			
10:15 – 11:00	Break and Exhibit Inspection			
11:00 – 12:30	Session M3A Medical Devices I	Session M3B Polymer Fabrication Process INVITED SPEAKER	Session M3C Energy Harvesters I INVITED SPEAKER	Session M3D Inertial Sensors
12:30 – 14:00	Lunch			
14:00 – 16:00	Poster Session M4P and Exhibit Inspection			
16:00 – 17:30	Session M5A Microfluidics I INVITED SPEAKER	Session M5B Pressure Sensors INVITED SPEAKER	Session M5C pMUT	Session M5D Bio Sensors
17:45 – 19:00	Special Event – Future Visions for Transducers Part II Panel Discussion			
19:00 – 20:00	Monday Evening Reception			

MONDAY PROGRAM

26 JUNE

Welcome Address and Technical Program Information

New Hall

08:45 – 09:15

Conference Chair:
Satoshi Konishi, *Ritsumeikan University, JAPAN*

Executive Program Chair:
Shuji Tanaka, *Tohoku University, JAPAN*

Organizing Committee Chair:
Osamu Tabata, *Kyoto University of Advanced Science, JAPAN*

Plenary Presentation 1

Session Chair:
Shuji Tanaka, Tohoku University, JAPAN

New Hall

09:15 – 10:00

M1A.P1 **RETINAL REGENERATION USING IPS CELLS – WITH ROBOTIC BIOLOGY**
Masayo Takahashi[1,2]
[1]*Vision Care Inc., JAPAN and* [2]*Ritsumeikan University, JAPAN*

2023 Transducers Early Career Award Presentation

New Hall

10:00 – 10:15

Award Recipient:
Azadeh Ansari, *Georgia Tech, USA*

10:15 – 11:00 **Break and Exhibit Inspection**

Session M3A – Medical Devices I

Session Chairs:
Lourdes Basabe, *University of the Basque Country, SPAIN*
Tao Li, *University of Cincinnati, USA*

New Hall

11:00 – 11:15

M3A.01 **SELF-POWERED WEARABLE BITE FORCE SENSOR FOR CONTINUOUS BRUXISM MONITORING**
Kenta Ichikawa and Wataru Hijikata
Tokyo Institute of Technology, JAPAN

11:15 – 11:30

M3A.02 **A SEMI-PASSIVE SMART CONTACT LENS WITH ON-LENS STORAGE ELEMENT**
Shun-Hsi Hsu, Cheng-Wei Tsai, Yu-Chieh Huang, Guan-Ting Yeh, Cheng-Yu Hsu, Chun-Yu Wu, Jhu-Jyun Yang, Xuan-Wei Zhang, Yu-Hsuan Huang, and Jin-Chern Chiou
National Yang Ming Chiao Tung University, TAIWAN

11:30 – 11:45

M3A.03 **AN TISSUE-ADHESIVE PIEZOELECTRIC SOFT SENSOR FOR IN VIVO HEALTHCARE**
Chan Wang[1], Zhuo Liu[2], Ying Liu[2], Yizhu Shan[2], Xuecheng Qu[2], Jiangtao Xue[2], Tianyiyi He[1], Hong Zhou[1], Weixin Liu[1], Zhou Li[2], and Chengkuo Lee[1]
[1]*National University of Singapore, SINGAPORE and*
[2]*Chinese Academy of Sciences, CHINA*

Session M3A – Medical Devices I
Continued

New Hall

11:45 – 12:00

M3A.04 **BALLOON CATHETER WITH IN SITU PRESSURE SENSING FUNCTION FOR EVALUATING HEMODYNAMICS**
Yizhou Wang[1,2,3], Chengxu Wang[1,2,3], Jianrong Wang[1], Lei Geng[2,3], Xiangyu Cao[4], and Xing Chen[1]
[1]Beihang University, CHINA, [2]Tiangong University, CHINA, [3]Tianjin Key Laboratory of Optoelectronic Detection Technology and Systems, CHINA, and [4]Chinese PLA General Hospital, CHINA

12:00 – 12:15

M3A.05 **DEVELOPMENT OF HOLLOW TYPED MICRONEEDLES PATCH WITH CONTINUOUS GLUCOSE MONITORING SENSOR BASED ON POLYLACTIC ACID**
Shicheng Zhou[1], Yutaro Chino[2], Toshihiro Kasama[1], Ryo Miyake[1], Takehiro Sato[1], Shigenobu Mitsuzawa[3], and Madoka Takai[1]
[1]University of Tokyo, JAPAN, [2]Sanyo Chemical Industries, Ltd., JAPAN, and [3]Honda Motor Co., Ltd., JAPAN

12:15 – 12:30

M3A.06 **HYDROGEL MICRONEEDLE ARRAY WITH ARRANGED COLURIMETRIC GLUCOSE-SENSING MICROBEADS FOR TRANSDERMAL PATCH TESTING**
Mayu Omote, Tomomi Murayama, Shuhei Takatsuka, and Hiroaki Onoe
Keio University, JAPAN

Session M3B – Polymer Fabrication Process
Session Chairs:
Jing-Quan Liu, *Shanghai Jiao Tong University, CHINA*
Hiroaki Onoe, *Keio University, JAPAN*

Event Hall

11:00 – 11:30

M3B.01 **INVITED PRESENTATION**
DIRECT INK WRITING 3D PRINTING FOR FABRICATING MICROFLUIDIC ELECTRONIC DEVICES
Michinao Hashimoto
Singapore University of Technology and Design (SUTD), SINGAPORE

11:30 – 11:45

M3B.03 **MULTILEVEL MICROCHANNEL-BASED, 3D PRINTED AND LIQUID-METAL FILLED MICROELECTRODE ARRAY WITHIN A MULTIPHASE CONTROLLED MICROCHAMBER FOR ELECTROPHYSIOLOGICAL STUDIES**
Jorge Manrique Castro, Isaac Johnson, and Swaminathan Rajaraman
University of Central Florida, USA

Session M3B – Polymer Fabrication Process
Continued

Event Hall

11:45 – 12:00

M3B.04 **STRETCHABLE HEATER WITH ENTANGLED VERTICALLY ALIGNED CARBON NANOTUBES**
Kyubin Bae, Sangjun Sim, and Jongbaeg Kim
Yonsei University, KOREA

12:00 – 12:15

M3B.05 **BILAYER SELF-FOLDING METHOD WITH HIGH FOLDING FORCE AND ANGLE BY SUPPRESSING DELAMINATION OF SHRINK LAYER**
Yusuke Sato, Takashi Sato, and Eiji Iwase
Waseda University, JAPAN

12:15 – 12:30

M3B.06 **PAVING SMART ROADS: ROLL-TO-ROLL LASER MANUFACTURING OF TAR-BASED STRAIN SENSOR NETWORKS**
Man Zhang, Jincai Huang, and Xining Zang
Tsinghua University, CHINA

Session M3C – Energy Harvesters I
Session Chairs:
Hiroshi Toshiyoshi, *University of Tokyo, JAPAN*
Fei Wang, *Southern University of Science and Technology (SUSTech), CHINA*

Room A

11:00 – 11:30

M3C.01 **INVITED PRESENTATION**
TRIBOELECTRIC NANOSENSOR: A PROTOTYPE OF SELF-POWERED SENSOR BASED ON CONTACT ELECTRIFICATION
Zong-Hong Lin
National Taiwan University, TAIWAN

11:30 – 11:45

M3C.03 **MONOLITHIC INTEGRATION OF THICK NDFEB MICRO-MAGNETS INTO MEMS: APPLICATION TO ELECTROMAGNETIC ENERGY HARVESTING**
Elías Angulo-Cervera[1], Frederico Orlandini-Keller[2], Ilona Lecerf[1,3], Pierre Moritz[1,3], Fabrice Mathieu[1], David Bourrier[1], Samuel Charlot[1], Richard Haettel[2], Thibaut Devillers[2], Liviu Nicu[1], Thomas Blon[3], Lise-Marie Lacroix[3,4], Nora M. Dempsey[2], and Thierry Leïchlé[1,5]
[1]*LAAS-CNRS, FRANCE,* [2]*Institut NEEL, FRANCE,* [3]*LPCNO, FRANCE,* [4]*IUF, FRANCE, and* [5]*IRL Georgia Tech-CNRS, USA*

11:45 – 12:00

M3C.04 **OUTPUT CHARACTERISTICS ON KIRIGAMI THERMOELECTRIC GENERATOR BY THREE-DIMENSIONAL DEFORMATION AND GEOMETRIC SHAPES**
Shingo Terashima and Eiji Iwase
Waseda University, JAPAN

Session M3C – Energy Harvesters I
Continued

Room A

12:00 – 12:15

M3C.05 **SELF-POWERED WEARABLE LIMB MOTION MONITORING SYSTEM USING FLEXIBLE THERMOELECTRIC POWER GENERATOR**
Jinfeng Yuan, Yuzhong Zhang, Caise Wei, and Rong Zhu
Tsinghua University, CHINA

12:15 – 12:30

M3C.06 **TRIBOELECTRIC PRESSURE SENSOR WITH SURFACE CHARGE DENSITY CALIBRATION**
Chankyu Han, Jungrak Choi, and Inkyu Park
Korea Advanced Institute of Science and Technology (KAIST), KOREA

Session M3D – Inertial Sensors
Session Chairs:
Behraad Bahreyni, *Simon Fraser University, CANADA*
Heng Yang, *Chinese Academy of Sciences (CAS), CHINA*

Room D

11:00 – 11:15

M3D.01 **ELECTROCHEMICAL SEISMOMETER BASED ON ONE SINGLE SILICON CHIP WITH FOUR ELECTRODES**
Zhenyu Sun[1,2], Tian Liang[1,2], Lintao Hu[1,2], Maoqi Zhu[1,2], Mingbo Zhang[1,2], Junbo Wang[1,2], Deyong Chen[1,2], and Jian Chen[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

11:15 – 11:30

M3D.02 **ULTRA-HIGH SENSITIVITY PULL-IN TIME MEMS ACCELEROMETER FOR SATELLITE GRAVIMETRY**
Inês S. Garcia[1], Dimitri E. Santos[1], José B. Queiroz[1], João T. da Encarnação[2,3], Tiago Hormigo[4], Jorge Cabral[5], Filipe S. Alves[1], and Rosana A. Dias[1]
[1]*International Iberian Nanotechnology Laboratory (INL), PORTUGAL,* [2]*Delft University of Technology, NETHERLANDS,* [3]*University of Texas, Austin, USA,* [4]*Spin.Works S.A., PORTUGAL, and* [5]*University of Minho, PORTUGAL*

11:30 – 11:45

M3D.03 **FREQUENCY-MODULATED MEMS ACCELEROMETER WITH DUAL-LAYER PROCESS FOR MINIMUM AREA OCCUPATION OF ANCHOR POINTS**
Christian Padovani[1], Riccardo Nastri[1], Leonardo Pagani Gaffuri[1], Gabriele Gattere[2], Francesco Rizzini[2], and Giacomo Langfelder[1]
[1]*Politecnico di Milano, ITALY and* [2]*STMicroelectronics, ITALY*

11:45 – 12:00

M3D.04 **ELECTROTHERMALLY TUNABLE ACCELEROMETER WITH SMALL TUNING VOLTAGE AND VERY LARGE SENSITIVITY TUNING RANGE**
Yu-Chi Chuang, Yuan-Chieh Lee, and Yi Chiu
National Yang Ming Chiao Tung University, TAIWAN

Session M3D – Inertial Sensors
Continued

Room D

12:00 – 12:15

M3D.05 **DEMONSTRATION OF WIDE DYNAMIC RANGE MEASUREMENT OF A MICROCONTROLLER-BASED MEMS GYRO MODULE BY FUSING THE OUTPUTS OF TWO DIFFERENT OPERATION MODES**
Yasushi Tomizawa, Fumito Miyazaki, Daiki Ono, Hideaki Murase, Jumpei Ogawa, Tazuko Tomioka, Kei Masunishi, Etsuji Ogawa, Fumitaka Ishibashi, and Kengo Uchida
Toshiba Corporation, JAPAN

12:15 – 12:30

M3D.06 **HIGH-SENSITIVITY ELECTROCHEMICAL ANGULAR ACCELEROMETER RELYING ON SOI-BASED MICROELECTRODES**
Tian Liang[1,2], Mingbo Zhang[1,2], Lintao Hu[1,2], Zhenyu Sun[1,2], Maoqi Zhu[1,2], Deyong Chen[1,2], Jian Chen[1,2], and Junbo Wang[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

12:30 – 14:00 **Lunch and Exhibit Inspection**

Poster Session M4P and Exhibit Inspection
Event Hall

14:00 – 16:00
Poster presentations are listed by topic category with their assigned number starting on page 51.

Session M5A – Microfluidics I
Session Chairs:
Irene Fernandez-Cuesta, *Universität Hamburg, GERMANY*
Sung Kwon Cho, *University of Pittsburgh, USA*

New Hall

16:00 – 16:30

M5A.01 **INVITED PRESENTATION**
NEW OPPORTUNITIES TO DETECT DISEASE AND PROBE MICROBIALS USING LAB-ON-A-CHIP DEVICES
Amy Q. Shen
Okinawa Institute of Science and Technology Graduate University, JAPAN

16:30 – 16:45

M5A.03 **SYNTHESIS AND DIRECT INSERTION OF MEMBRANE PROTEIN INTO MONODISPERSE GUVS FABRICATED BY A MICROFLUIDIC DEVICE**
Satoshi Nanjo[1], Mamiko Tsugane[1], Ryotaro Yoneyama[1], Ryota Ushiyama[1], Tomoaki Matsuura[2], and Hiroaki Suzuki[1]
[1]*Chuo University, JAPAN and* [2]*Tokyo Institute of Technology, JAPAN*

Session M5A – Microfluidics I
Continued

New Hall

16:45 – 17:00

M5A.04 **HIGH EFFICIENCY CELL-BEAD PAIRING VIA DIELECTROPHORESIS-CONTROLLED QUEUING PROCESS FOR SINGLE-CELL ANALYSIS**
Yao Cai[1], Zhuzhu Liu[1], Shijia Yang[2], Fei Su[3], Duli Yu[1], Xiaoxing Xing[1], and Yuan Luo[2,4]
[1]*Beijing University of Chemical Technology, CHINA,*
[2]*Chinese Academy of Sciences (CAS), CHINA,*
[3]*China-Japan Friendship Hospital, CHINA, and*
[4]*University of Chinese Academy of Sciences, CHINA*

17:00 – 17:15

M5A.05 **CONTINUOUS PRODUCTION OF CELL-ENCAPSULATED DROPLETS FOR MEMBRANE FUSION OF CELLS UTILIZING A MICROFLUIDIC DEVICE**
Hiroki Fukunaga[1], Naotomo Tottori[1], Shinya Sakuma[1], Tomomi Tsubouchi[2], and Yoko Yamanishi[1]
[1]*Kyushu University, JAPAN and*
[2]*National Institute for Basic Biology, JAPAN*

17:15 – 17:30

M5A.06 **OPTIMIZING SCREENING PROCESS OF APTAMERS ON A MICROFLUIDIC SYSTEM BY SHEAR FORCE CONTROL FOR APTAMERS SPECIFIC TO FOLATE RECEPTOR ALPHA**
Yi-Cheng Tsai, Yang-Sheng Shao, Hung-Bin Wu, and Gwo-Bin Lee
National Tsing Hua University, TAIWAN

Session M5B – Pressure Sensors
Session Chairs:
Chang-Jin "CJ" Kim, *University of California, Los Angeles, USA*
Junbo Wang, *Chinese Academy of Sciences (CAS), CHINA*

Event Hall

16:00 – 16:30

M5B.01 **INVITED PRESENTATION**
ELECTRO-ACTIVE MATERIALS FOR SOFT ROBOTS AND WEARABLES
Vito Cacucciolo
Omnigrasp Srl, ITALY, Politecnico di Bari, ITALY, and Massachusetts Institute of Technology, USA

16:30 – 16:45

M5B.03 **A RESONANT MICROSENSOR FOR MULTI-PARAMETER MEASUREMENT OF DIFFERENTIAL PRESSURE, TEMPERATURE AND STATIC PRESSURE**
Chao Cheng[1,2], Jiahui Yao[1,2], Han Xue[1,2], Yulan Lu[1], Junbo Wang[1,2], Deyong Chen[1,2], and Jian Chen[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

Session M5B – Pressure Sensors
Continued

Event Hall

16:45 – 17:00

M5B.04 **A RESONANT HIGH-PRESSURE SENSOR WITH AN H-CAVITY**
Jie Yu[1,2], Zongze Yu[1,2], Pan Qian[1,2], Yulan Lu[1], Jian Chen[1,2], Junbo Wang[1,2], and Deyong Chen[1,2]
[1]*Chinese Academy of Sciences (CAS) and*
[2]*University of Chinese Academy of Sciences, CHINA*

17:00 – 17:15

M5B.05 **NOVEL THERMAL MEMS DYNAMIC PRESSURE SENSOR**
Akash Gupta[1], Achim Bittner[1], and Alfons Dehé[1,2]
[1]*Hahn-Schickard-Gesellschaft für Angewandte Forschung e.V., GERMANY and* [2]*University of Freiburg, GERMANY*

17:15 – 17:30

M5B.06 **NONLINEARITY COMPENSATION FOR MEMS PRESSURE SENSORS WITH PIEZORESISTORS AT THE NEUTRAL POSITION**
Grim Keulemans[1], Appo van der Wiel[2], Ben Maes[2], Maliheh Ramezani[2], Michael Kraft[1], and Chen Wang[1]
[1]*KU Leuven, BELGIUM and* [2]*Melexis, BELGIUM*

Session M5C – pMUT
Session Chairs:
Annalisa De-Pastina, *Silicon Austria Labs GmbH, AUSTRIA*
Tao Wu, *ShanghaiTech University, CHINA*

Room A

16:00 – 16:15

M5C.01 **CHARACTERIZATION OF PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCERS FOR BIOMEDICAL APPLICATIONS**
Bruno Fain, François Blard, Jean-Rémi Chatroux, Romain Liechti, Fabrice Casset, Antoine Hamelin, Jean-Claude Bastien, and Hélène Lhermet
University Grenoble Alpes, FRANCE

16:15 – 16:30

M5C.02 **FLEXIBLE ULTRASONIC TRANSDUCER FOR RF-DATA AND ENERGY TRANSMISSION THROUGH THE METAL PIPE**
Javad Abbaszadeh, Vladimir Pashchenko, Lukas Rauter, and Mohssen Moridi
Silicon Austria Labs GmbH (SAL), AUSTRIA

16:30 – 16:45

M5C.03 **HIGH-SPL PMUT ARRAY FOR MID-AIR HAPTIC INTERFACE**
Fan Xia[1], Yande Peng[1], Wei Yue[1], Chun-Ming Chen[1], Sedat Pala[1], Ryuichi Arakawa[1,2], and Liwei Lin[1]
[1]*University of California, Berkeley, USA and*
[2]*NGK Spark Plug Co., JAPAN*

Session M5C – pMUT
Continued

Room A

16:45 – 17:00

M5C.04 **IN-AIR LONG-RANGE ENVIRONMENTAL TEMPERATURE SENSING WITH A SINGLE SCANDIUM-DOPED ALUMINUM NITRIDE PMUT ARRAY**

Mantalena Sarafianou[1], Daniel Ssu-Han Chen[1], David Sze Wai Choong[1], Duan Jian Goh[1], Jihang Liu[1], Srinivas Merugu[1], Qing Xin Zhang[1], Huamao Lin[1], Steven H.J. Lee[1], Peter H.K. Chang[1], Yee Lung Lee[3], Carlo L. Prelini[2], Filippo D'Ercoli[2], Dao Hao Sim[3], Alberto Leotti[3], Laura Castoldi[2], Domenico Giusti[2], and Joshua E.-Y. Lee[1]

[1]*Agency for Science, Technology and Research (A*STAR), SINGAPORE,* [2]*STMicroelectronics, ITALY and* [3]*STMicroelectronics, SINGAPORE*

17:00 – 17:15

M5C.05 **TILTABLE CANTILEVER-PLATE BASED PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCERS (PMUT) WITH LARGE LINEAR VIBRATION RANGE AND HIGH OUTPUT POWER**

Tingzhong Xu, Javad Abbaszadeh, Claire Bourquard, Angela Darie, and Mohssen Moridi

Silicon Austria Labs GmbH (SAL), AUSTRIA

17:15 – 17:30

M5C.06 **A SINGLE-CHIP CMOS-MEMS CMUT ARRAY TRANSCEIVER WITH LOW BIAS**

Hung-Yu Chen, Yung-Shun Chan, Tzu-Hsuan Hsu, Ming-Huang Li, and Sheng-Shian Li

National Tsing Hua University, TAIWAN

Session M5D – Bio Sensors
Session Chairs:
Minghao Nie, *University of Tokyo, JAPAN*
Yoko Yamanishi, *Kyushu University, JAPAN*

Room D

16:00 – 16:15

M5D.01 **NANOPLASMONIC BIOSENSOR FOR CYTOKINE PROFILING IN PATIENT PLASMA**

Lip Ket Chin[1], Hyungsoon Im[2], Sung-Gyu Park[3], and Benjamin Chousterman[4]

[1]*City University of Hong Kong, HONG KONG,* [2]*Massachusetts General Hospital, USA,* [3]*Korea Institute of Materials Science, KOREA, and* [4]*Hôpital Lariboisière, FRANCE*

16:15 – 16:30

M5D.02 **LAB-ON-CMOS RESONANT MICRO-CALORIMETER**

Rafel Perelló-Roig[1,2], Jaume Verd[1,2], Sebastià Bota[1,2], Toshikazu Nishida[3], and Jaume Segura[1,2]

[1]*University of the Balearic Islands, SPAIN,* [2]*Health Research Institute of the Balearic Islands, SPAIN, and* [3]*University of Florida, USA*

Session M5D – Bio Sensors
Continued

Room D

16:30 – 16:45

M5D.03 **A NOVEL RADIAL CHIP FOR COLLECTION OF EXHALED BREAT TO DETECT COVID-19**
James D. Morris, Zhenzhen Xie, Jiapeng Huang, Michael H. Nantz, and Xiao-An Fu
University of Louisville, USA

16:45 – 17:00

M5D.04 **IN-VITRO REAL-TIME IDENTIFICATION OF CORONAVIRUS SPIKE PROTEINS VIA ULTRASENSITIVE MID-INFRARED HOOK NANOANTENNAS ARRAY**
Zhihao Ren, Hong Zhou, Zixuan Zhang, Cheng Xu, and Chengkuo Lee
National University of Singapore, SINGAPORE

17:00 – 17:15

M5D.05 **A FLEXIBLE GLUCOSE SENSOR WITH ANTI-SWELLING AND CONDUCTIVITY ZWITTERIONIC HYDROGEL ENZYME MEMBRANE**
Chengcheng Li, Zhihua Pu, Hao Zheng, Zijing Guo, Wangwang Zhu, and Dachao Li
Tianjin University, CHINA

17:15 – 17:30

M5D.06 **DUAL METHYLATED BRCA1/BRCA2 DETECTION ON AN APTAMER-BASED INTEGRATED MICROFLUIDIC SYSTEM**
Chih-Hung Wang[1], Keng-Fu Hsu[2], and Gwo-Bin Lee[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*National Cheng Kung University, TAIWAN*

17:30 – 17:45 **Transition**

Special Event – Future Visions for Transducers Part II
Session Chair:
Taeko Ando, *Ritsumeikan University, JAPAN*

New Hall

17:45 – 19:00
Panel Discussion

Monday Evening Reception
New Hall

19:00 – 20:00

20:00 **End of Day**

TUESDAY AT A GLANCE

08:30 – 09:15	**Plenary Presentation 2** Jörg Wrachtrup, *University of Stuttgart, GERMANY*			
09:15 – 09:30	**Transducers 2025 Announcement**			
09:30 – 09:45	**Transition Break**			
09:45 – 10:45	**Session T2A** **Cell**	**Session T2B** **Actuators I**	**Session T2C** **Environmental Sensors**	**Session T2D** **Functional Materials & Fabrication I**
10:45 – 11:15	**Break and Exhibit Inspection**			
11:15 – 12:45	**Session T3A** **Tissue Engineering I** **INVITED SPEAKER**	**Session T3B** **Nanoscale Materials & Fabrication**	**Session T3C** **Energy Harvesters II**	**Session T3D** **Force Sensors** **INVITED SPEAKER**
12:45 – 14:15	**Lunch**			
14:15 – 16:15	**Poster Session T4P and Exhibit Inspection**			
16:15 – 17:30	**Session T5A** **Medical Devices II**	**Session T5B** **Micromirrors**	**Session T5C** **Acoustic Devices**	**Session T5D** **Microfluidics II**
17:30 – 17:40	**Transition Break**			
17:40 – 19:10	**Special Event – Industry**			
19:10 – 20:00	**Tuesday Wine and Cheese Reception**			

TUESDAY PROGRAM

27 JUNE

Plenary Presentation 2

Session Chair:
Xinxin Li, *SIMIT-CASI, CHINA*

New Hall

08:30 – 09:15

T1A.P2 **MINIATURIZED QUANTUM SENSORS**

Michelle Schweizer[1], Jixing Zhang[1], Michael Kübler[1], Magnus Benke[1], and **Jörg Wrachtrup**[1,2]
[1]*University of Stuttgart, GERMANY and*
[2]*Max Planck Institute for Solid State Research, GERMANY*

Transducers 2025 Announcement

New Hall

09:15 – 09:30

09:30 – 09:45 **Transition**

Session T2A – Cell

Session Chairs: Ioana Voiculescu, *City University of New York, USA*
José Antonio Plaza, *Instituto de Microelectrónica de Barcelona (IMB-CNM (CSIC)), SPAIN*

New Hall

09:45 – 10:00

T2A.01 **CYTOTRANSDUCERS VISUALIZE FUNCTIONS OF LIVING CELLS**
Niko Kimura and Shinya Sakuma
Kyushu University, JAPAN

10:00 – 10:15

T2A.02 **DIRECT MONITORING OF NEUROTRANSMITTER EXOCYTOSIS IN LIVING CELLS USING ELECTROCHEMICAL SENSORS FABRICATED WITH MIXED-DIMENSIONAL BIOSENSING NANOSTRUCTURES**
Pengcheng Xu[1,2], Xuefeng Wang[1], Hao Jia[1,2], Yuan Zhang[3], and Xinxin Li[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA,*
[2]*University of Chinese Academy of Sciences, CHINA, and*
[3]*Shanghai University, CHINA*

10:15 – 10:30

T2A.03 **THE SEARCH FOR THE MAXIMUM 2D-PARTICLE SIZE THAT CAN BE INTERNALIZED BY LIVING CELLS**
Marta Duch[1], Ana Fernández-Escribano[2], Maria Isabel Arjona[1], Patricia Vázquez[2], Juan Pablo Agusil[1], Mariano Redondo-Horcajo[2], Adrian Rodríguez-Lau[1], Ana Sánchez[1], Sergi Sánchez[1], Teresa Suárez[2], and José Antonio Plaza[1]
[1]*Institute of Microelectronics of Barcelona, SPAIN and*
[2]*Centre for Biological Research Margarita Salas (CSIC), SPAIN*

10:30 – 10:45

T2A.04 **A MICIROFLUIDIC FLOW CYTOMETRY ENABLING HIGH-THROUGHPUT CHARACTERIZATION OF SINGLE-CELL IMPEDANCE AND IMAGING BASED ON CONSTRICTIONAL MICROCHANNELS COUPLED WITH DEEP NEURAL NETWORKS**
Xiao Chen[1,2], Xukun Huang[1,2], Huiwen Tan[1,2], Minruihong Wang[1,2], Yimin Li[1,2], Yuanchen Wei[1], Jie Zhang[1], Deyong Chen[1,2], Yueying Li[1], Junbo Wang[1,2], and Jian Chen[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

Session T2B – Actuators I

Session Chairs:
Takeshi Hayakawa, *Chuo University, JAPAN*
Rong Zhu, *Tsinghua University, CHINA*

Event Hall

09:45 – 10:00

T2B.01 **DESIGN AND EXPERIMENTAL VALIDATION OF A NEW MEMS LONG-STROKE ACTUATOR BASED ON TUNNEL-COMB FINGERS**
Valentina Zega[1], Andrea Opreni[1], Yassine Banani[1], Andrea Buffoli[1], Flavia D. Mauri[1], Gabriele Gattere[2], Manuel Riani[2], Giacomo Langfelder[1], and Attilio Frangi[1]
[1]*Politecnico di Milano, ITALY and* [2]*STMicroelectronics, ITALY*

10:00 – 10:15

T2B.02 **DOWNSCALING AND TEMPERATURE HOMOGENIZATION OF TINIHF/SI SHAPE MEMORY MICROACTUATORS**
Gowtham Arivanandhan[1], Zixiong Li[1], Sabrina M. Curtis[2,3], Eckhard Quandt[2], and Manfred Kohl[1]
[1]*Karlsruhe Institute of Technology (KIT), GERMANY,*
[2]*Kiel University (CAU), GERMANY, and*
[3]*University of Maryland, USA*

10:15 – 10:30

T2B.03 **3D ELECTRON-BEAM WRITING OF NANOACTUATORS IN GENETICALLY ENGINEERED SPIDER SILK PROTEINS**
Nan Qin[1,2], Xiawei Yue[1,2], Jiachuang Wang[1,2], Zening Li[1,2], and Tiger H. Tao[1,2,3,4,5]
[1]*Chinese Academy of Science (CAS), CHINA,* [2]*University of Chinese Academy of Sciences, CHINA,* [3]*Neuroxess Co., Ltd., CHINA,* [4]*Guangdong Institute of Intelligence Science and Technology, CHINA, and* [5]*Tianqiao and Chrissy Chen Institute for Translational Research, CHINA*

10:30 – 10:45

T2B.04 **SELF-ASSEMBLED NANOSCALE CILIARY ACTUATORS**
Minsu Kang[1], Hosup Jung[3], Moon Kyu Kwak[3], and Hoon Eui Jeong[1]
[1]*Ulsan National Institute of Science & Technology (UNIST), KOREA,*
[2]*Seoul National University, KOREA, and*
[3]*Kyungpook National University, KOREA*

Session T2C – Environmental Sensors

Session Chairs:
Andreas Hierlemann, *ETH Zurich, SWITZERLAND*
Chung Hoon Lee, *Marquette University, USA*

Room A

09:45 – 10:00

T2C.01 **HIGH-PERFORMANCE SILICON CARBIDE-ON-INSULATOR THERMORESISTIVE HIGH-TEMPERATURE SENSOR UP TO 750 °C**
Baoyun Sun, Jiarui Mo, Willem D. van Driel, and Guoqi Zhang
Delft University of Technology, NETHERLANDS

Session T2C – Environmental Sensors
Continued

Room A

10:00 – 10:15

T2C.02 **MOSFET-BASED AND P-N DIODE BASED TEMPERATURE SENSORS IN A 4H-SIC CMOS TECHNOLOGY**
Jiarui Mo[1], Jinglin Li[1], Yaqian Zhang[1], Alexander May[2], Tobias Erlbacher[2], Guoqi Zhang[1], and Sten Vollebregt[1]
[1]*Delft University of Technology, NETHERLANDS and*
[2]*Fraunhofer Institute for Integrated System and Devices Technology IISB, GERMANY*

10:15 – 10:30

T2C.03 **DEVELOPMENT OF A HIGH SENSITIVITY PELTIER TYPE SOIL WATER CONTENT SENSOR FOR MONITORING AGRICULTURAL MEDIA**
Masato Futagawa, Haruki Sato, Kisho Sakamoto, and Satoshi Ota
Shizuoka University, JAPAN

10:30 – 10:45

T2C.04 **ALGAN/GAN SPLIT-ELECTRODE SECTORIAL SENSOR ARRAY FOR ULTRA-LOW MAGNETIC FIELD DETECTION AT 8 μT**
Lingxi Xia[1,2] and Yung C. Liang[1,2]
[1]*National University of Singapore, SINGAPORE and*
[2]*National University of Singapore, Suzhou, CHINA*

Session T2D – Functional Materials & Fabrication I
Session Chairs:
Naoki Inomata, *Tohoku University, JAPAN*
Da-Jeng Yao, *National Tsing Hua University, TAIWAN*

Room D

09:45 – 10:00

T2D.01 **HYBRID MICROFABRICATION, AND ELECTROCHEMICAL ANALYSIS OF NONAGONAL 2D/3D MICROELECTRODE ARRAYS, WITH MULTI-METALLIC INTERFACES**
Charles M. Didier[1], Maria Corina Garcia-Chaulbad[2], Julia F. Orrico[1], Jorge Manrique Castro[1], and Swaminathan Rajaraman[1]
[1]*University of Central Florida, USA and*
[2]*Polytechnic University of Puerto Rico, PUERTO RICO*

10:00 – 10:15

T2D.02 **MANUFACTURING OF FLEXIBLE METALLIC AEROGEL BY ICE-TEMPLATED ASSEMBLY OF NANOWIRES AND ITS APPLICATIONS**
Donghyun Lee and Jungwook Choi
Chung-Ang University, KOREA

Session T2D – Functional Materials & Fabrication I
Continued

Room D

10:15 – 10:30

T2D.03 **SIMPLE FABRICATION OF PARYLENE-BASED SLIPPERY LIQUID-INFUSED POROUS SURFACES FOR HEALTHCARE APPLICATIONS**

Kuang-Ming Shang[1], Haixu Shen[1], Hiroyuki Kato[2], Suhash Aravindan[1], Hirotake Komatsu[2], and Yu-Chong Tai[1]

[1] *California Institute of Technology, USA and* [2] *Arthur Riggs Diabetes & Metabolism Research Institute at City of Hope, USA*

10:30 – 10:45

T2D.04 **APPLYING GRAYSCALE DIGITAL MASKS AND DEFOCUSING METHOD TO DIGITAL LIGHT PROCESSING STEREOLITHOGRAPHY FOR RAPID MANUFACTURE OF MICROLENS ARRAYS**

Chih-Yu Hsieh[1], Pin-Chuan Chen[1], Pai-Shan Chen[2], and Yi-Hsin Liu[3]

[1] *National Taiwan University of Science and Technology, TAIWAN,* [2] *National Taiwan University, TAIWAN, and* [3] *National Taiwan Normal University, TAIWAN*

Session T3A – Tissue Engineering I
Session Chairs:

Fernando Benito-Lopez, *University of the Basque Country, SPAIN*

Frank Niklaus, *KTH – Royal Institute of Technology, SWEDEN*

New Hall

11:15 – 11:45

T3A.01 **INVITED PRESENTATION**

ORGAN-ON-CHIP FOR PHYSIOLOGY AND DEVELOPMENT OF NEW THERAPIES

Karen Cheung

University of British Columbia, CANADA

11:45 – 12:00

T3A.03 **TARGETING NANOCARRIERS COMBINED WITH PHOTOTHERMAL THROMBOLYTIC THERAPY TESTED FROM IN VITRO, AND THROMBOSIS VESSEL-ON-A-CHIP, TO IN VIVO**

Kuan-Ting Liu[1], Er-Yuan Chuang[2], Yu-Jui Fan[2], and Jiashing Yu[1]

[1] *National Taiwan University, TAIWAN and* [2] *Taipei Medical University, TAIWAN*

12:00 – 12:15

T3A.04 **A HIGHLY SENSITIVE CAPACITIVE DISPLACEMENT SENSOR FOR FORCE MEASUREMENT INTEGRATED IN AN ENGINEERED HEART TISSUE PLATFORM**

Milica Dostanić[1,2], Filippo Pfaiffer[1], Mahdieh Shojaei-Baghini[1], Laura M. Windt[2], Maury Wiendels[2], Berend J. van Meer[2], Christine L. Mummery[2,3], Pasqualina M. Sarro[1], and Massimo Mastrangeli[1]

[1] *TU Delft, NETHERLANDS,* [2] *Leiden University Medical Center, NETHERLANDS, and* [3] *University of Twente, NETHERLANDS*

Session T3A – Tissue Engineering I
Continued

New Hall

12:15 – 12:30

T3A.05 **HIGH THROUGHPUT, MULTIMODAL, MICROCHAMBER BIOSENSORS FOR *IN VITRO* SELECTIVE LOCALIZATION OF KILLIFISH CARDIAC MODELS**
Andre Childs[1], Isaac Johnson[1], Benjamin Dubansky[2], and Swaminathan Rajaraman[1]
[1]*University of Central Florida, USA and* [2]*Louisiana State University, USA*

12:30 – 12:45

T3A.06 **REAL-TIME ASSESSMENT OF MATURITY BY MICROFIBER-SHAPED IPSCS-DERIVED CARDIAC TISSUE**
Akari Masuda[1], Shun Itai[1], Yuta Kurashina[2], Shugo Tohyama[1], and Hiroaki Onoe[1]
[1]*Keio University, JAPAN and* [2]*Tokyo University of Agriculture and Technology, JAPAN*

Session T3B – Nanoscale Materials & Fabrication
Session Chairs: Inkyu Park, *Korea Advanced Institute of Science and Technology (KAIST), KOREA*
Michael Kraft, *KU Leuven, BELGIUM*

Event Hall

11:15 – 11:30

T3B.01 **SILICON-NANODOT-INDUCED STRENGTH CONTROL FOR SILICON MEMS**
Abbhiraj Singh, Shingo Kammachi, and Takahiro Namazu
Kyoto University of Advanced Science, JAPAN

11:30 – 11:45

T3B.02 **DISSIPATION AND LOSS ANGLE IN TWO-DIMENSIONAL MOLYBDENUM DITELLURIDE NANOELECTROMECHANICAL RESONATORS**
Pengcheng Zhang[1], Yueyang Jia[1], Zuheng Liu[1], and Rui Yang[1,2]
[1]*University of Michigan – Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University, CHINA and* [2]*Shanghai Jiao Tong University (SJTU), CHINA*

11:45 – 12:00

T3B.03 **LONG-WAVE INFRARED GRAPHENE PHOTODETECTORS FOR POLARIZATION DETECTION AND GAS SENSING**
Junsheng Xie, Zhihao Ren, Jingxuan Wei, Weixin Liu, Jingkai Zhou, and Chengkuo Lee
National University of Singapore, SINGAPORE

Session T3B – Nanoscale Materials & Fabrication
Continued

Event Hall

12:00 – 12:15

T3B.04 **DEMONSTRATION OF A NON-VOLATILE ANTIFERROELECTRIC PYROELECTRIC SWITCH**
Patrick D. Lomenzo[1], Songrui Li[1], Thomas Mikolajick[1,2], and Uwe Schroeder[1]
[1]*NaMLab gGmbH, GERMANY and* [2]*TU Dresden, GERMANY*

12:15 – 12:30

T3B.05 **HIGH-SA/V-RATIO TiO_2-NANOPARITCLE-ENCAPSULATING HYDROGEL UNIT PROMOTES EFFICIENT LIGHT-DRIVEN SELF-ASSEMBLY**
Natsumi Watanabe and Hiroaki Onoe
Keio University, JAPAN

12:30 – 12:45

T3B.06 **TITANIUM/SILICA BIOCOMPATIBLE NANOPARTICLES WITH TUNABLE EXOTHERMIC CHARACTERISTICS FOR FUTURE HYPERTHERMIA TECHNOLOGY**
Kingkarn Khotchasing, Michiko Shindo, and Takahiro Namazu
Kyoto University of Advanced Science, JAPAN

Session T3C – Energy Harvesters II
Session Chairs:
Philippe Basset, *Université Gustave Eiffel, FRANCE*
Peter Woias, *University of Freiburg, GERMANY*

Room A

11:15 – 11:30

T3C.01 **MEMS ELECTROSTATIC ENERGY HARVESTER WITH RECHARGEABLE ELECTRET BY BUILT-IN CORONA TIPS**
Anxin Luo, Mingjie Li, Wenxin Luo, Xiaojiang Liu, and Fei Wang
Southern University of Science and Technology, CHINA

11:30 – 11:45

T3C.02 **DUAL-PHASE ROPE-SPUN ELECTRET ROTARY GENERATOR FOR MORPHING WING ENERGY HARVESTING AND DEFORMATION MONITORING**
Huipeng Zhou, Xinhui Mao, Zhe Zhao, Yu Liu, Weizheng Yuan, Honglong Chang, and Kai Tao
Northwestern Polytechnical University, CHINA

11:45 – 12:00

T3C.03 **ORIGAMI-INSPIRED TRANSFORMABLE ELECTRET GENERATOR FOR FLAPPING-LEAF WIND ENERGY HARVESTING**
Boming Lyu[1], Yangyang Gao[1], Zhaoshu Yang[2], Jin Wu[3], Honglong Chang[1], Weizheng Yuan[1], and Kai Tao[1]
[1]*Northwestern Polytechnical University, CHINA*
[2]*China Astronaut Research and Training Center, CHINA, and*
[3]*Sun Yat-sen University, CHINA*

Session T3C – Energy Harvesters II
Continued

Room A

12:00 – 12:15

T3C.04 **SELF-POWERED DUST REMOVAL SYSTEM FOR SOLAR PANELS DRIVEN BY A ROTARY FREESTANDING-ELECTRET GENERATOR**
Rong Ding, Junchi Teng, Zeyuan Cao, Zibo Wu, Kang Deng, Xiangzhu Yuan, Yujia Cao, and Xiongying Ye
Tsinghua University, CHINA

12:15 – 12:30

T3C.05 **FREQUENCY TRACKING OF VIBRATIONAL ENERGY HARVESTER USING PHASE-LOCKED LOOP (PLL)**
Yuto Akai, Hiroaki Honma, and Hiroshi Toshiyoshi
University of Tokyo, JAPAN

12:30 – 12:45

T3C.06 **SUPPRESSING THE AIR-BREAKDOWN PHENOMENON OF ELECTROSTATIC GENERATOR FOR EFFICIENT ENERGY HARVESTING**
Zeyuan Cao, Rong Ding, Junchi Teng, Zibo Wu, and Xiongying Ye
Tsinghua University, CHINA

Session T3D – Force Sensors
Session Chairs:
Honglong Chang, *Northwestern Polytechnical University, CHINA*
Valentina Zega, *Politecnico di Milano, ITALY*

Room D

11:15 – 11:45

T3D.01 **INVITED PRESENTATION**
MEMS SENSOR DRIFT COMPENSATION WITH ON-CHIP STRESS SENSING
Erdinc Tatar
Bilkent University, TURKEY

11:45 – 12:00

T3D.03 **AN ACTIVE-MATRIX PIEZOELECTRIC TACTILE SENSOR ARRAY WITH IN-PIXEL AMPLIFIER AND NON-UNIFORMITY COMPENSATION**
Tengteng Lei, Yushen Hu, Xinying Xie, and Man Wong
Hong Kong University of Science and Technology, HONG KONG

12:00 – 12:15

T3D.04 **MONOLITHICALLY VERTICAL INTEGRATION WITH CAPACITIVE PROXIMITY AND INDUCTIVE FORCE SENSOR WITH SENSING RANGE ENHANCEMENT**
Ruei-Cing Mai[1], Fuchi Shih[1], Yuanyuan Huang[1], Yu-Hsuan Li[1], I-Yu Huang[2], Yu-Cheng Lin[3], and Weileun Fang[1]
[1]National Tsing Hua University, TAIWAN, [2]National Sun Yat-sen University, TAIWAN, and [3]National Cheng Kung University, TAIWAN

Session T3D – Force Sensors
Continued

Room D

12:15 – 12:30

T3D.05 **A LOW POWER AND ULTRATHIN FLEXIBLE SHEAR STRESS SENSOR WITH HIGH SENSITIVITY SUSPENDED OVER A FLEXIBLE SUBSTRATE**
Xiangyu Song, Ke Xiao, and Wei Xu
Shenzhen University, CHINA

12:30 – 12:45

T3D.06 **A STRAIN-INSENSITIVE STRETCHABLE PATCH SENSOR FOR SIMULTANEOUS MONITORING OF BODY TEMPERATURE AND ECG**
Sudeep Sharma, Ashok Chhetry, Seonghoon Jeong, and Jae Yeong Park
Kwangwoon University, KOREA

12:45 – 14:15 **Lunch and Exhibit Inspection**

Poster Session T4P and Exhibit Inspection
Event Hall

14:15 – 16:15

Poster presentations are listed by topic category with their assigned number starting on page 51.

Session T5A – Medical Devices II
Session Chairs:
Eiji Iwase, *Waseda University, JAPAN*
Michael Kraft, *KU Leuven, BELGIUM*

New Hall

16:15 – 16:30

T5A.01 **HYBRID BIODEGRADABLE POLYMER STENT FABRICATION USING 3D PRINTERS AND INTEGRATION WITH WIRELESS SENSORS FOR REAL-TIME PRESSURE MONITORING IN BLOOD VESSELS**
Jin-liang Wei, Nomin-Eredne Oyunbaatar, Dong-Su Kim, and Dong-Weon Lee
Chonnam National University, KOREA

16:30 – 16:45

T5A.02 **A SENSOR-INTEGRATED "SMART" URETERAL STENT AND WIRELESS IN-VITRO TEST FOR REAL-TIME OBSTRUCTION DETECTION**
Mohammad Reza Yousefi Darestani, Dirk Lange, Ben H. Chew, and Kenichi Takahata
University of British Columbia, CANADA

Session T5A – Medical Devices II
Continued

New Hall

16:45 – 17:00

T5A.03 **ULTRA-SOFT NEURAL PROBE WITH A TEMPORARY HIGH-STRENGTH U-SECTION COATING BY PICOSECOND LASER MICROMACHINING**

Fanqi Sun[1], Xiaoli You[1], Yuhao Zhou[1], Minghao Wang[2], Mengfei Xu[3], Xichen Yuan[1], Honglong Chang[1], Jingquan Liu[3], and Bowen Ji[1]

[1] *Northwestern Polytechnical University, CHINA,* [2] *Hangzhou Dianzi University, CHINA, and* [3] *Shanghai Jiao Tong University, CHINA*

17:00 – 17:15

T5A.04 **SELF-STRETCHABLE CHRISTMAS-TREE-SHAPED ULTRAFLEXIBLE NEURAL PROBES**

Ye Tian[1,2], Cunkai Zhou[1], Kuikui Zhang[4], Huiran Yang[1], Zhaohan Chen[5], Zhitao Zhou[1,2], Xiaoling Wei[1,2], Tiger H. Tao[1,2,6,7,8], and Liuyang Sun[1,3]

[1] *Chinese Academy of Sciences (CAS), CHINA,* [2] *University of Chinese Academy of Sciences, CHINA,* [3] *Shanghai University of Electric Power, CHINA,* [4] *Nanjing Tech University, CHINA,* [5] *Shanghai Normal University, CHINA,* [6] *Neuroxess Co., Ltd. (Jiangxi), CHINA,* [7] *Guangdong Institute of Intelligence Science and Technology, CHINA, and* [8] *Tianqiao and Chrissy Chen Institute for Translational Research, CHINA*

17:15 – 17:30

T5A.05 **BIOMIMETIC FLEXIBLE NEURO-PROBE SYSTEM FOR EARLY WARNING WITH FORCE FEEDBACK TO AVOID VASCULAR DAMAGE**

Yu Zhou[1,2], Huiran Yang[1,2], Xueying Wang[1,2], Heng Yang[1,2], Ke Sun[1,2], Zhitao Zhou[1,2], Liuyang Sun[1,2], Meng Li[1,2], Jianlong Zhao[1,2], Tiger H. Tao[1,2,3,4,5], and Xiaoling Wei[1,2]

[1] *Chinese Academy of Sciences (CAS), CHINA,* [2] *University of Chinese Academy of Sciences, CHINA,* [3] *Neuroxess Co., Ltd. (Jiangxi), CHINA,* [4] *Guangdong Institute of Intelligence Science and Technology, CHINA, and* [5] *Tianqiao and Chrissy Chen Institute for Translational Research, CHINA*

Session T5B – Micromirrors
Session Chairs:
Jaka Pribosek, *Silicon Austria Labs GmbH, AUSTRIA*
Huikai Xie, *Beijing Institute of Technology, CHINA*

Event Hall

16:15 – 16:30

T5B.01 **INTEGRATED THERMAL CONVECTION-BASED POSITION SENSING FOR ELECTROTHERMAL MICROMIRRORS**

Anrun Ren, Yingtao Ding, Hengzhang Yang, Teng Pan, and Huikai Xie

Beijing Institute of Technology, CHINA

Session T5B – Micromirrors
Continued

Event Hall

16:30 – 16:45

T5B.02 **MEMS SCANNING GRATING BASED COMPACT DIFFUSE REFLECTANCE SPECTROSCOPIC MODULE FOR SKIN ANALYSIS**

Jaehun Jeon, Jung-Woo Park, Gi Beom Kim, and Ki-Hun Jeong
Korea Advanced Institute of Science and Technology (KAIST), KOREA

16:45 – 17:00

T5B.03 **NOVEL BOW-SHAPE TRANSMISSION SPRINGS FOR PIEZOELECTRIC MEMS MIRROR WITH 180-DEGREES OPTICAL SCANNING ANGLE**

Si-Han Chen[1], Shih-Chi Liu[1], Hung-Yu Lin[1], Jerwei Hsieh[2], and Weileun Fang[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*Asia Pacific Microsystems, Inc., TAIWAN*

17:00 – 17:15

T5B.04 **DESIGN OF A BI-AXIAL PIEZOELECTRIC MEMS SCANNER WITH TRI-GIMBAL STRUCTURE FOR SCANNING PATTERN ENHANCEMENT**

Chih-Chen Hsu[1], Hao-Chien Cheng[1,2], Shi-Chi Liu[1], Hung-Yu Lin[1], Mingching Wu[2], Kai-Chih Liang[2], and Weileun Fang[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*Coretronic MEMS Corporation, TAIWAN*

17:15 – 17:30

T5B.05 **FABRICATION AND CHARACTERIZATION OF A NOVEL PIEZOELECTRIC MEMS MIRROR WITH HIGH FILL FACTOR AND HIGH SPEED**

Yang Wang[1,4], LiHao Wang[1], Hao Zhang[5], YiChen Liu[1], YuYao Zhang[3], WeiHong Zhu[3], YongGui Zhang[1], and Zhenyu Wu[1,2,3,4]
[1]*Shanghai Institute of Microsystem and Information Technology, CHINA,* [2]*Shanghai Industrial μtechnology Research Institute, CHINA,* [3]*Shanghai University, CHINA,* [4]*University of Chinese Academy of Sciences, CHINA, and* [5]*Chinese Academy of Sciences (CAS), CHINA*

Session T5C – Acoustic Devices

Session Chairs:
Sid Ghosh, *Northeastern University, USA*
Göran Stemme, *KTH – Royal Institute of Technology, SWEDEN*

Room A

16:15 – 16:30

T5C.01 **LOW DIELECTRIC LOSS TANGENT, HIGHLY SCANDIUM DOPED ALUMINUM NITRIDE THIN FILM FOR ACOUSTIC DEVICES**
Takahiro Higuchi[1], Akihiko Teshigahara[1], Kenji Kijima[1], Takashi Kakefuda[2], Takahide Usui[2], Yusuke Kawai[1], Takashi Omichi[2], and Hiroyuki Wado[1]
[1] *MIRISE Technologies Corporation, JAPAN and*
[2] *Nisshinbo Micro Devices Inc., JAPAN*

16:30 – 16:45

T5C.02 **HOW TO TURN A MEMS MICROPHONE INTO A PHOTOACOUSTIC SENSOR: AN EXPERIMENTAL STUDY**
Thomas Strahl[1,2], Jonas Steinebrunner[2], Christian Weber[1,2], Jürgen Wöllenstein[1,2], and Katrin Schmitt[1,2]
[1] *University of Freiburg, GERMANY and* [2] *Fraunhofer Institute for Physical Measurement Techniques IPM, GERMANY*

16:45 – 17:00

T5C.03 **WAFER-SCALE TRANSFER-FREE GRAPHENE MEMS CONDENSER MICROPHONES**
Roberto Pezone, Gabriele Baglioni, Leonardo di Paola, Pasqualina M. Sarro, Peter G. Steeneken, and Sten Vollebregt
Delft University of Technology, NETHERLANDS

17:00 – 17:15

T5C.04 **A NOVEL HIGH-SNR FULL BANDWIDTH PIEZOELECTRIC MEMS MICROPHONE BASED ON A FULLY CLAMPED ALUMINUM NITRIDE CORRUGATED MEMBRANE**
Gabriele Bosetti[1], Christian Bretthauer[2], Andreas Bogner[2], Michael Krenzer[2], Karolina Gierl[2], Hans-Joerg Timme[2], Heinrich Heiss[2], and Gabriele Schrag[1]
[1] *Technical University of Munich, GERMANY and*
[2] *Infineon Technologies AG, GERMANY*

17:15 – 17:30

T5C.05 **DUAL-FREQUENCY ALUMINUM SCANDIUM NITRIDE PIEZOELECTRIC MICROPHONES WITH WIDE BANDWIDTH, LARGE DYNAMIC RANGE, AND HIGH SENSITIVITY FOR WIND TUNNEL TESTING**
Yanfen Zhai[1], Thai Anh Tuan Nguyenand[2], Lokesh Kumar Reddy Onteru[1], Claire Bourquard[1], Annalisa De-Pastina[1], Alexander Shatalov[1], Nikolai Andrianov[1], Xuyuan Chen[2], and Lixiang Wu[1]
[1] *Silicon Austria Labs GmbH (SAL), AUSTRIA and*
[2] *University of South-Eastern Norway, NORWAY*

Session T5D – Microfluidics II

Session Chairs:

Boris Stoeber, *University of British Columbia, CANADA*

Yi-Kuen Lee, *Hong Kong University of Science and Technology, HONG KONG*

Room D

16:15 – 16:30

T5D.01 **OPENABLE DOUBLE-MICROTUBES STRUCTURE DRIVEN BY PNEUMATIC BALLOON ACTUATOR ARRAYS FOR TUBULAR ORGAN-ON-A-CHIP**

Shiho Shimizu, Keiichiro Nishizaki, and Satoshi Konishi

Ritsumeikan University, JAPAN

16:30 – 16:45

T5D.02 **ACOUSTOFLUIDIC MICROMANIPULATION SYSTEM WITH AN OPEN MICROFLUIDIC CHIP**

Natsumi Hirata and Takeshi Hayakawa

Chuo University, JAPAN

16:45 – 17:00

T5D.03 **SPERM ENRICHMENT AND FOULING MITIGATION IN BUBBLE-BASED ACOUSTOFLUIDIC FILTRATION MICRODEVICE**

Ting-Yu Wan, Tsui-Ting Lee, Hsiao-Lin Hwa, and Yen-Wen Lu

National Taiwan University, TAIWAN

17:00 – 17:15

T5D.04 **ACOUSTIC TWEEZERS USING BISYMMETRIC COHERENT SURFACE ACOUSTIC WAVES FOR RECONFIGURABLE MODULATION OF PARTICLE MULTIMERS**

Hemin Pan, Deqing Mei, and Yancheng Wang

Zhejiang University, CHINA

17:15 – 17:30

T5D.05 **LASER-WRITTEN CONDUCTIVE TRACKS FOR THE INTEGRATION OF SURFACE-MOUNT DEVICES ONTO PMMA**

Tina Mitteramskogler, Andreas Fuchsluger, Rafael Ecker, Andreas Tröls, and Bernhard Jakoby

Johannes Kepler University Linz, AUSTRIA

17:30 – 17:40 **Transition**

Special Event – Industry

Session Chair:
Shuji Tanaka, *Tohoku University, JAPAN*

New Hall

17:40 – 18:10

FROM MEMS-SENSORS TO BIOMEMS – INVENTED FOR LIFE
Presenter: Franz Lärmer
Robert Bosch GmbH, GERMANY

18:10 – 18:40

EPSON'S MEMS TECHNOLOGY: PRECISION CORE A NEXT-GENERATION INKJET PRINTING TECHNOLOGY CREATED BY EPSON
Presenter: Eiju Hirai
Seiko Epson Corporation, JAPAN

18:40 – 19:10

MARKET DEVELOPMENT IN THE WORLD OF MEMS AND SENSORS
Presenter: Paul Carey
SEMI MEMS & Sensors Industry Group, USA

19:10	**End of Day**

Tuesday Wine and Cheese Reception

New Hall

19:10 – 20:00

Tō-ji Temple and Lotus Flowers in Kyoto (Image by Route16; AdobeStock).

WEDNESDAY AT A GLANCE

08:30 – 09:15	Plenary Presentation 3 Molly S. Shoichet, *University of Toronto, CANADA*			
09:15 – 09:30	Transition Break			
09:30 – 10:45	Session W2A Fluidic Control	Session W2B Optical Devices	Session W2C Packaging & Fabrication	Session W2D Non-Linear Resonators
10:45 – 11:15	Break and Exhibit Inspection			
11:15 – 12:45	Session W3A Microfluidics III INVITED SPEAKER	Session W3B Chemical Sensors I	Session W3C Resonating Devices	Session W3D Logic Devices & Switches INVITED SPEAKER
12:45 – 14:15	Lunch			
14:15 – 16:15	Poster Session W4P and Exhibit Inspection			
16:15 – 17:45	Session W5B Chemical Sensors II INVITED SPEAKER	Session W5C RF Resonators	Session W5D Intelligent Bio-Chemical Sensors	Session W5E Functional Materials & Fabrication II INVITED SPEAKER
18:00 – 21:00	CONFERENCE BANQUET			

WEDNESDAY PROGRAM

28 JUNE

Plenary Presentation 3

Session Chair:
Ellis Meng, *University of Southern California, USA*

New Hall

08:30 – 09:15

W1A.P3 **MIMICKING THE CELLULAR MICROENVIRONMENT WITH 3D HYDROGELS ENABLES TARGET DISCOVERY AND DRUG SCREENING**
Molly S. Shoichet, Arianna Skyrzinska, Laura Bahlmann, Laura Smith, Amber Xue, Roger Tam, Alexander Baker, and Aleczandria Tiffany
University of Toronto, CANADA

09:15 – 09:30 Transition

Session W2A – Fluidic Control

Session Chairs:
Hanseup Kim, *University of Utah, USA*
Daisuke Yamane, *Ritsumeikan University, JAPAN*

New Hall

09:30 – 09:45

W2A.01 **MICRODROPLET REACTIONS BY HYPERBRANCHED, SPACE-FILLING OPEN MICROFLUIDIC CHANNELS**
Hiroyuki Kai
Toyo University, JAPAN

09:45 – 10:00

W2A.02 **CHIRALITY SENSING MECHANISM USING VERTICAL CONTACT CONTROL OF LIQUID CRYSTAL MICRO-DROPLETS**
Shinji Bono[1,2,3] and Satoshi Konishi[1,2,3]
[1]*Ritsumeikan University, JAPAN,* [2]*Ritsumeikan Advanced Research Academy, JAPAN, and* [3]*Ritsumeikan Global Innovation Research Organization, JAPAN*

10:00 – 10:15

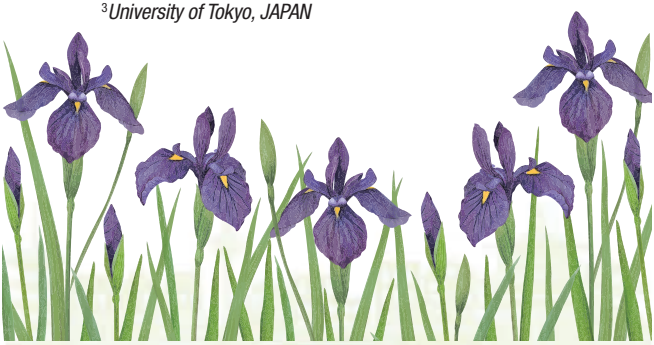
W2A.03 **LOCALIZED ELECTROCHEMICAL DEPOSITION OF MULTI- METAL STRUCTURES BY HYDRODYNAMIC FLOW CONFINEMENT**
Daniel Widerker[1], Govind Kaigala[1], and Moran Bercovici[2]
[1]*Technion, Israel Institute of Technology, ISRAEL and* [2]*University of British Columbia, CANADA*

10:15 – 10:30

W2A.04 **LENS-LESS ACOUSTIC TWEEZERS BASED ON SPIRAL-ARM VORTEX-BEAM TRANSDUCERS CAPABLE OF LEVITATING, TRAPPING, AND MANIPULATING LARGE AND HEAVY PARTICLES**
Jaehoon Lee, Kianoush Sadeghian Esfahani,
Matin Barekatain, and Eun S. Kim
University of Southern California, USA

10:30 – 10:45

W2A.05 **FLUORESCENCE-ACTIVATED MULTI-SORTING OF SINGLE CELLS UTILIZING HIGH-SPEED ON-CHIP FLOW CONTROL**
Makoto Saito[1], Niko Kimura[1], Shigeo S. Sugano[2], Yoko Yamanishi[1], Fumihito Arai[3], and Shinya Sakuma[1]
[1]*Kyushu University, JAPAN,* [2]*National Institute of Advanced Industrial Science and Technology (AIST), JAPAN, and* [3]*University of Tokyo, JAPAN*



Session W2B – Optical Devices

Session Chairs:
Victor Javier Cadarso Busto, *Monash University, AUSTRALIA*
Ulrike Wallrabe, *University of Freiburg, GERMANY*

Event Hall

09:30 – 09:45

W2B.01 **METAMATERIAL-ENHANCED VIBRATIONAL CIRCULAR DICHROISM FOR MID-INFRARED SPECTROSCOPIC NANOSENSORS**
Cheng Xu[1,2], Zhihao Ren[1,2], Hong Zhou[1,2], Jingkai Zhou[1], Chong Pei Ho[2], Nan Wang[2], and Chengkuo Lee[1]
[1]*National University of Singapore, SINGAPORE and* [2]*Agency for Science, Technology and Research (A*STAR), SINGAPORE*

09:45 – 10:00

W2B.02 **MULTIFUNCTIONAL METASURFACE FOR A MINIATURIZED REFLECTION-TYPE ATOMIC VAPOR CELL**
Ponrapee Prutphongs[1], Katsuma Aoki[1], Satoshi Ikezawa[1], Motoaki Hara[2], and Kentaro Iwami[1]
[1]*Tokyo University of Agriculture and Technology, JAPAN and* [2]*National Institute of Information and Communication Technology, JAPAN*

10:00 – 10:15

W2B.03 **AN ALL-METAL METASURFACE FOR HIGH-EFFICIENCY REFRACTIVE INDEX SENSING BASED ON REFLECTION-TYPE SURFACE LATTICE RESONANCE**
Liye Li[1], Lijun Ma[1], Yifan Ouyang[1], Hongshun Sun[1], Shengxiao Jin[1], Senyong Hu[1], Meizhang Wu[2], Zhimei Qi[3], and Wengang Wu[1]
[1]*Peking University, CHINA,* [2]*University of Science and Technology Beijing, CHINA, and* [3]*University of Chinese Academy of Sciences, CHINA*

10:15 – 10:30

W2B.04 **AN INTEGRATED PLATFORM FOR CAVITY OPTOMECHANICS WITH VACUUM-SEALED SILICON PHOTONIC MEMS**
Pierre Edinger[1], Gaehun Jo[1], Simon J. Bleiker[1], Alain Y. Takabayashi[2], Niels Quack[2], Peter Verheyen[3], Umar Khan[3,4], Wim Bogaerts[3,4], Cleitus Antony[5], Frank Niklaus[1], and Kristinn B. Gylfason[1]
[1]*KTH Royal Institute of Technology, SWEDEN,* [2]*École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND,* [3]*IMEC, BELGIUM,* [4]*Ghent University, BELGIUM, and* [5]*Tyndall National Institute, IRELAND*

10:30 – 10:45

W2B.05 **FIRST DEMONSTRATION OF SELF-POWERED ALGAN/GAN UV PHOTODETECTOR ENABLED BY NON-PLANAR SCHOTTKY DEPLETION**
Yuhan Pu[1,2] and Yung C. Liang[1,2]
[1]*National University of Singapore, SINGAPORE and* [2]*National University of Singapore (Suzhou) Research Institute, CHINA*

Session W2C – Packaging & Fabrication

Session Chairs:
Chun Wen "Emerson" Cheng, *TSMC, TAIWAN*
Hiromasa Yagyu, *Kanto Gakuin University, JAPAN*

Room A

09:30 – 09:45

W2C.01 **3D PRINTING OF SILICA-HSQ COMPOSITES WITH SUB-MICROMETER RESOLUTION AND SELECTIVELY GENERATED SILICON NANOCRYSTALS**
Po-Han Huang[1], Miku Laakso[1], Oliver Hartwig[2], Georg S. Duesberg[2], Göran Stemme[1], Kristinn B. Gylfason[1], and Frank Niklaus[1]
[1]*KTH Royal Institute of Technology, SWEDEN and*
[2]*Universität der Bundeswehr Munich, GERMANY*

09:45 – 10:00

W2C.02 **A TIME-MATCHED SiO_2-LAYER ETCH FOR ADVANCED MEMS FOUNDRY PROCESSESD MULTI-PROJECT CHIP (MPC)**
Sushil Kumar, Khanjan Joshi, and Pushpapraj Singh
Indian Institute of Technology Delhi, INDIA

10:00 – 10:15

W2C.03 **LIQUID-IN-A-MEMS: ENCAPSULATION OF LIQUID IN A MICROCAPSULE BY INKJET PRINTING**
Jongeon Park, Arnaud Bertsch, and Juergen Brugger
École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND

10:15 – 10:30

W2C.04 **DOUBLE-LEVEL TEMPORARY PROTECTIVE PACKAGING OF TSV-BASED MICRO-MIRROR ARRAY FOR OPTICAL-WINDOW-FREE VERTICAL INTEGRATION**
Yuhu Xia[1,2], Biyun Ling[1], Xiaoyue Wang[1], Minli Cai[1,2], and Yaming Wu[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

10:30 – 10:45

W2C.05 **THE HETEROGENEOUS PACKAGING OF A 3 × 3 MINI-LED ARRAY FOR SMART CONTACT LENS APPLICATIONS**
Cheng-Wei Tsai, Guan-Ting Yeh, Shun-Hsi Hsu, Shin-Ho Wu, Yu-Hsuan Huang, Her-Ming Chiueh, and Jin-Chern Chiou
National Yang Ming Chiao Tung University, TAIWAN

Session W2D – Non-Linear Resonators

Session Chairs:
Cristina Consani, *Silicon Austria Labs GmbH, AUSTRIA*
Hao Jia, *Chinese Academy of Sciences (CAS), CHINA*

Room D

09:30 – 09:45

W2D.01 **OPERATION OF ARRAYED LOGIC ELEMENTS FOR MEMS ISING MACHINE**
Shun Yasunaga, Motohiko Ezawa, Keigo Tsuji, Kei Misumi, Tomoki Sawamura, Shinji Tsuboi, Ayako Mizushima, Yukinori Ochiai, Akio Higo, and Yoshio Mita
University of Tokyo, JAPAN

09:45 – 10:00

W2D.02 **EFFICIENT RESERVOIR COMPUTING BY NONLINEARLY COUPLED PIEZOELECTRIC MEMS RESONATORS**
Takeshi Yoshimura[1], Taiki Haga[1], Norifumi Fujimura[1], Kensuke Kanda[2], and Isaku Kanno[3]
[1]*Osaka Metropolitan University, JAPAN,* [2]*University of Hyogo, JAPAN, and* [3]*Kobe University, JAPAN*

10:00 – 10:15

W2D.03 **CONSTRUCTING MICROMECHANICAL FREQUENCY COMBS IN BIFURCATING ATTRACTOR BRANCHES FOR EVENT TRIGGERED SENSORS**
Ting-Yi Chen, Chun-Pu Tsai, and Wei-Chang Li
National Taiwan University, TAIWAN

10:15 – 10:30

W2D.04 **VIBRO-IMPACT PERTURBATION BASED ATTRACTOR EXCHANGER FOR OPEN-LOOP NONLINEAR RESONATORS**
Chun-Pu Tsai and Wei-Chang Li
National Taiwan University, TAIWAN

10:30 – 10:45

W2D.05 **IMPROVING THE DYNAMIC RANGE AND RESOLUTION OF MEMS RESONANT SENSORS UTILIZING NONLINEAR CANCELLATION**
Chengxin Li[1], Aojie Quan[1], Hemin Zhang[2], Chen Wang[1], Mustafa Mert Torunbalci[3], Linlin Wang[1], Chenxi Wang[1], Yangyang Guan[1], Yuan Wang[4], and Michael Kraft[1]
[1]*KU Leuven, BELGIUM,* [2]*Northwestern Polytechnical University, CHINA,* [3]*Broadcom, USA, and* [4]*University of Macau, CHINA*

10:45 – 11:15 **Break and Exhibit Inspection**

Session W3A – Microfluidics III

Session Chairs:
Andreu Llobera, *Silicon Austria Labs GmbH, AUSTRIA*
Göran Stemme, *KTH – Royal Institute of Technology, SWEDEN*

New Hall

11:15 – 11:45

W3A.01 **INVITED PRESENTATION**
FUNCTIONAL MATERIALS FOR SENSING AND ACTUATION IN MICROFLUIDICS
Sandra Garcia-Rey, Udara Bimendra Gunatilake, Yara Alvarez-Braña, Lourdes Basabe-Desmonts, and Fernando Benito-Lopez
University of the Basque Country, SPAIN

11:45 – 12:00

W3A.03 **A HIGH-THROUGHPUT UNIFORM-SIZED DROPLET GENERATOR WITH A TRIANGULAR CROSS-SECTION CHANNEL FABRICATED BY SIMPLE MEMS PROCESS AND SELF-ALIGNMENT**
Byeolnim Oh[1], Youngseo Cho[2], Jaewon Park[3], Younghak Cho[2], and Hyun Soo Kim[1]
[1]*Kwangwoon University, KOREA,* [2]*Seoul National University of Science and Technology, KOREA, and* [3]*Korea University, KOREA*

12:00 – 12:15

W3A.04 **IONIC SIGNAL AMPLIFICATION ACTUATED BY GAS DISSOLUTION**
Sangjin Seo and Taesung Kim
Ulsan National Institute of Science and Technology (UNIST), KOREA

12:15 – 12:30

W3A.05 **ALGINATE HYDROGEL MICROBEADS WITH DIFFERENT MESH STRUCTURES ENABLE CONTROLLED RELEASE OF ADENO-ASSOCIATED VIRUS FOR GENE THERAPY**
Aiki Hioki[1], Shuhei Takatsuka[1], Yuta Kurashina[2], and Hiroaki Onoe[1]
[1]*Keio University, JAPAN and*
[2]*Tokyo University of Agriculture and Technology, JAPAN*

12:30 – 12:45

W3A.06 **MECHANISM OF DRUG RELEASING UNIT VIA OSCILLATING BUBBLES AND INTEGRATION WITH 3-D MICROSWIMMER**
Wenbo Li, Fang-Wei Liu, and Sung Kwon Cho
University of Pittsburgh, USA

Session W3B – Chemical Sensors I

Session Chairs:
Mehdi Javanmard, *Rutgers University New Brunswick, USA*
Roland Zengerle, *Hahn-Schickard-Gesellschaft e.V., GERMANY*

Event Hall

11:15 – 11:30

W3B.01 **HYDROGEN-SENSING PROPERTIES AND REDUCTION-INDUCED SENSING MECHANISM OF NICKEL OXIDE NANOPLATES**
Tao Zhang[1,2], Ying Chen[1], Ming Li[1], Pengcheng Xu[1,3], Xinxin Li[1,3], and Dan Zheng[2]
[1]*Chinese Academy of Sciences (CAS), CHINA,*
[2]*Shanghai Institute of Technology, CHINA, and*
[3]*University of Chinese Academy of Sciences, CHINA*

11:30 – 11:45

W3B.02 **QUANTITATIVE MEASUREMENTS OF ADSORBED OXYGEN SPECIES ON MATERIAL SURFACE FOR HIGH-PERFORMANCE GAS SENSOR DESIGN**
Ruomeng Guo[1,2], Xinyu Li[1,3], Ming Li[1,3], Ying Chen[1,3], Pengcheng Xu[1,3], and Xinxin Li[1,3]
[1]*Chinese Academy of Sciences (CAS), CHINA,*
[2]*ShanghaiTech University, CHINA, and*
[3]*University of Chinese Academy of Sciences, CHINA*

11:45 – 12:00

W3B.03 **FAST AND SIMULTANEOUS GAS SENSING METHOD IN MIXED GASES USING MULTIPLE MICROMACHINED THERMAL CONDUCTIVITY DETECTORS FOR FUTURE CARBON-NEUTRAL SOCIETY**
Hiroaki Yamazaki, Ping Wang, Naoya Fujiwara, Yoshihiko Kurui, Naoki Hiramatsu, Fumitaka Ishibashi, Ryota Kitagawa, and Akihiro Kojima
Toshiba Corporation, JAPAN

12:00 – 12:15

W3B.04 **A CHAMELEON–INSPIRED FLEXIBLE HUMIDITY SENSOR BASED ON PEDOT: PSS–MEDIATED THERMOCHROMIC LIQUID CRYSTAL COMPOSITE MATERIALS**
Chong-Ren Sun, Yu-Hsuan Cheng, and Ching-Te Kuo
National Sun Yat-sen University, TAIWAN

12:15 – 12:30

W3B.05 **MONOLITHIC INTEGRATION OF GAS/HUMIDITY/TEMPERATURE SENSORS WITH THERMAL COUPLING EFFECT REDUCTION**
Chi-Te Fang[1], Tung-Lin Chien[1], Yung-Chen Li[1], Yuanyuan Huang[1], Yu-Cheng Lin[2], I-Yu Huang[3], and Weileun Fang[1]
[1]*National Tsing Hua University, TAIWAN,* [2]*National Cheng Kung University, TAIWAN, and* [3]*National Sun Yat-sen University, TAIWAN*

Session W3B – Chemical Sensors I
Continued

Event Hall

12:30 – 12:45

W3B.06 **FABRICATION OF HIGH-RESOLUTION MULTI-ION IMAGE SENSOR USING RUBBER-BASED NEGATIVE RESIST AND EXTRACELLULAR ION IMAGING IN THE HIPPOCAMPAL SLICE**

Moe Kato[1], Jumpei Otsuka[1], Hideo Doi[1], Bijay Parajuli[2], Tomoko Horio[1], Eiji Shigetomi[2], Youichi Shinozaki[2], Yong Joon Choi[1], Kazuhiro Takahashi[1], Toshiaki Hattori[1], Toshihiko Noda[1], Schuichi Koizumi[2], and Kazuaki Sawada[1]
[1] *Toyohashi University of Technology, JAPAN and*
[2] *University of Yamanashi, JAPAN*

Session W3C – Resonating Devices
Session Chairs:
Sheng-Shian Li, *National Tsing Hua University, TAIWAN*
Mohssen Moridi, *Silicon Austria Labs GmbH, AUSTRIA*

Room A

11:15 – 11:30

W3C.01 **TEMPERATURE COMPENSATION IN CMOS-MEMS OSCILLATORS VIA FOLDED-ANCHOR RESONATOR GEOMETRICAL TUNING**

Rafel Perelló-Roig[1,2], Salvador Barceló[1,2], Jaume Verd[1,2], Sebastià Bota[1,2], and Jaume Segura[1,2]
[1] *University of the Balearic Islands, SPAIN and* [2] *Health Research Institute of the Balearic Islands, SPAIN*

11:30 – 11:45

W3C.02 **COMPACT MEMS TEMPERATURE SENSOR EXPLOITING A DUAL-MODE POLYSILICON RESONATOR AND PHASE-LOCKED-LOOP MULTIPLICATION**

Paolo Frigerio[1], Andrea Fagnani[1], Valentina Zega[1], Gabriele Gattere[2], Attilio Frangi[1], and Giacomo Langfelder[1]
[1] *Politecnico di Milano, ITALY and* [2] *STMicroelectronics, ITALY*

11:45 – 12:00

W3C.03 **LISSAJOUS-FM RESONANT MAGNETOMETER**

Linxin Zhang, Takashiro Tsukamoto, and Shuji Tanaka
Tohoku University, JAPAN

12:00 – 12:15

W3C.04 **EXPLOITING BLUE SIDEBAND EXCITATION TO ENHANCE MODE LOCALIZATION IN A RESONANT DOUBLE-ENDED TUNING FORK MAGNETOMETER**

Yuan Wang[1], Chun Zhao[2], Jingqian Xi[4], Huafeng Liu[4], Chen Wang[3], Linlin Wang[3], Shaolin Zhang[4], Qiu Wang[4], Fangjing Hu[4], and Michael Kraft[3]
[1] *University of Macau, CHINA,* [2] *University of York, UK,* [3] *KU Leuven, BELGIUM, and* [4] *Huazhong University of Science and Technology, CHINA*

Session W3C – Resonating Devices
Continued

Room A

12:15 – 12:30

W3C.05 **A FREQUENCY COMB WITH HIGH RESOLUTION AND LOW THRESHOLD POWER BASED ON A SINGLE MODE CIRCULAR RESONATOR**
Hongyu Chen, Dongyang Chen, Ronghua Huan, and Jin Xie
Zhejiang University, CHINA

12:30 – 12:45

W3C.06 **A MASS SENSOR BASED ON 3-DOF MODE LOCALIZED BAW RESONATORS WITH ENHANCED QUALITY FACTOR AND RESOLUTION**
Linlin Wang[1], Chen Wang[1], Aojie Quan[1], Yuan Wang[2], Chenxi Wang[1], Bernardo P. Madeira[1], Chengxin Li[1], and Michael Kraft[1]
[1]*KU Leuven, BELGIUM and* [2]*University of Macau, CHINA*

Session W3D – Logic Devices & Switches
Session Chairs:
Deyong Chen, *University of Chinese Academy of Sciences, CHINA*
Caroline Coutier, *CEA Leti, FRANCE*

Room D

11:15 – 11:45

W3D.01 **INVITED PRESENTATION**
HARDWARE PLATFORM FOR EDGE COMPUTING BASED ON NANOELECTROMECHANICAL RELAYS
Dinesh Pamunuwa[1], Elliott Worsey[1], Qi Tang[1], Mukesh K. Kulsreshath[1], Victor Marot[1], Yingying Li[2], and Simon Bleiker[2]
[1]*University of Bristol, UK and*
[2]*Royal Institute of Technology (KTH), SWEDEN*

11:45 – 12:00

W3D.03 **CORRECTION OF TRANSMITTERS' PIXEL VALUES IN AN ULTRASONIC FOURIER TRANSFORM ANALOG COMPUTING APPARATUS**
Xing Haw Marvin Tan[1], Daniel Ssu-Han Chen[1], Zaifeng Yang[1], Viet Phuong Bui[1], Kevin Tshun Chuan Chai[1], Ching Eng Png[1], and Amit Lal[2]
[1]*Agency of Science Technology and Research (A*STAR), SINGAPORE and* [2]*Cornell University, USA*

12:00 – 12:15

W3D.04 **ADIABATIC LOGIC GATES FOR ULTRA-LOW-POWER OPERATION USING CONTACTLESS CAPACITIVE MEMS**
Aleksandra Marković[1], Laurent Mazenq[1], Adrian Laborde[1], Hervé Fanet[2], Gaël Pillonnet[2], and Bernard Legrand[1]
[1]*Université de Toulouse, FRANCE and*
[2]*Université Grenoble Alpes, FRANCE*

Session W3D – Logic Devices & Switches
Continued

Room D

12:15 – 12:30

W3D.05 **FULLY 3D-PRINTED, SEMICONDUCTOR-FREE, TRANSISTOR-LIKE LOGIC DEVICES**
Jorge Cañada and Luis Fernando Velásquez-García
Massachusetts Institute of Technology, USA

12:30 – 12:45

W3D.06 **ROBUST MEMS WAVEGUIDE SWITCH FOR THZ SPECTROSCOPY IN SPACE**
Sofia Rahiminejad, Sven van Berkel, Robin H. Lin, Cecile Jung-Kubiak, Goutam Chattopadhyay, and Mina Rais-Zadeh
California Institute of Technology, USA

12:45 – 14:15 **Lunch and Exhibit Inspection**

Poster Session W4P and Exhibit Inspection
Event Hall

14:15 – 16:15

Poster presentations are listed by topic category with their assigned number starting on page 51.

Session W5B – Chemical Sensors II
Session Chairs:
Markus Graf, *Karlsruhe University of Applied Sciences, GERMANY*
Shinya Sakuma, *Kyushu University, JAPAN*

Event Hall

16:15 – 16:45

W5B.01 **INVITED PRESENTATION**
GAS SENSING MECHANISMS REVEALED WITH EMERGING IN-SITU CHARACTERIZATION TECHNIQUES
Pengcheng Xu[1,2] and Xinxin Li[1,2]
[1]*Chinese Academy of Sciences, CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

16:45 – 17:00

W5B.03 **HIGH-RESPONSIVITY SINGLE-CRYSTAL SILICON MEMS THERMOPILES FOR DIFFERENTIAL THERMAL ANALYSIS (DTA)**
Haozhi Zhang[1,2], Hao Jia[1,2], Weiwen Feng[1,2], Pengcheng Xu[1,2], and Xinxin Li[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

Session W5B – Chemical Sensors II
Continued

Event Hall

17:00 – 17:15

W5B.04 **A NON-ENZYMATIC ELECTROCHEMICAL SENSOR BASED ON CERIUM OXIDE NANOCUBES FOR THE RAPID DETECTION OF HYDROGEN PEROXIDE RESIDUES IN FOOD SAMPLES**
Xuefeng Wang[1,2], Jiaci Shi[1,3], Wei Shen[1,3], Pengcheng Xu[1,2], and Xinxin Li[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA,*
[2]*University of Chinese Academy of Sciences, CHINA, and*
[3]*Shanghai Normal University, CHINA*

17:15 – 17:30

W5B.05 **LONG-LIFE SENSING FILM STRUCTURE AND RELIABILITY EVALUATION OF PD-CU-SI-METALLIC GLASS FOR HYDROGEN SENSOR**
Yumi Hayashi, Naoki Hiramatsu, Hiroaki Yamazaki, and Akihiro Kojima
Toshiba Corporation, JAPAN

17:30 – 17:45

W5B.06 **CMOS GAS-SENSING ARRAY BY NOVEL SENSING APPROACH USING MIXED-PIXEL- ARCHITECTURE FOR DETECTION OF VARIOUS RESPONSE OF GAS-SENSITIVE MEMBRANES**
Takeru Wada, Tomoki Kamijo, Yoshiko Noda, Daisuke Akai, Takeshi Hizawa, Yasuyuki Kimura, Yong-Joon Choi, Kazuhiro Takahasi, Kazuaki Sawada, and Toshihiko Noda
Toyohashi University of Technology, JAPAN

WEDNESDAY

Session W5C – RF Resonators
Session Chairs:
Azadeh Ansari, *Georgia Institute of Technology, USA*
Ming-Huang Li, *National Tsing Hua University, TAIWAN*

Room A

16:15 – 16:30

W5C.01 **AN INTRINSICALLY TEMPERATURE-COMPENSATED FULLY DIFFERENTIAL CMOS-MEMS RESONATOR WITH DUAL-RESISTOR PIEZORESISTIVE DETECTION**
Zhi-Qiang Lee, Jie-Sheng Jiang, Hung-Yu Chen, Sheng-Shian Li, and Ming-Huang Li
National Tsing Hua University, TAIWAN

16:30 – 16:45

W5C.02 **VERY HIGH FREQUENCY STABILITY OF SINGLE-CRYSTAL SILICON THERMAL-PIEZORESISTIVE RESONATORS WITH PHASE-LOCKED LOOP**
Connor A. Watkins[1], Jaesung Lee[1], Jonathan P. McCandless[2,3], Harris J. Hall[2], and Philip X.-L. Feng[1,3]
[1]*University of Florida, USA,* [2]*Air Force Research Laboratory, USA, and*
[3]*Case Western Reserve University, USA*

Session W5C – RF Resonators
Continued

Room A

16:45 – 17:00

W5C.03 **REDUCED ORDER MODELING OF PIEZOELECTRIC RESONATORS WITH MULTI-FREQUENCY IMPEDANCE ESTIMATION**
Kuan-Ting Chen, Tzu-Hsuan Hsu, Guan-Lin Wu, and Ming-Huang Li
National Tsing Hua University, TAIWAN

17:00 – 17:15

W5C.04 **EXPERIMENTAL STUDY OF THE ORIGIN OF NONLINEAR DAMPING IN VERY HIGH FREQUENCY CONTOUR MODE RESONATORS**
Yi Chan[1], Xuetian Wang[1], Juan S. Gomez-Diaz[2], and Jeronimo Segovia-Fernandez[3]
[1]*Beijing Institute of Technology, CHINA,* [2]*University of California, Davis, USA, and* [3]*Texas Instruments, USA*

17:15 – 17:30

W5C.05 **MICRO-TO-NANOACOUSTIC SCALN LAMB WAVE RESONATORS: FREQUENCY SCALING TOWARDS THE MM-WAVE SPECTRUM**
Gabriel Giribaldi, Luca Colombo, Pietro Simeoni, and Matteo Rinaldi
Northeastern University, USA

17:30 – 17:45

W5C.06 **NONLINEAR PERFORMANCE OF MONOLITHICALLY INTEGRATED SCALN-BASED GHZ ACOUSTIC FILTERS WITH RFSOI SWITCHES**
Chen Liu, Ying Zhang, Xinghua Wang, Wenjia Yang, Eugene Yi Zhun Woo, Danlei Yan, Raja M. Kumarasamy, Nan Wang, and Yao Zhu
*Agency of Science Technology and Research (A*STAR), SINGAPORE*

Session W5D – Intelligent Bio-Chemical Sensors
Session Chairs:
Paddy French, *TU Delft, NETHERLANDS*
Bruno Le Pioufle, *ENS Paris-Saclay, FRANCE*

Room D

16:15 – 16:30

W5D.01 **A MICROSYSTEM FOR NON-INVASIVE IMAGING AND SIMULTANEOUS MULTI-BIOMARKER 3D IMAGING**
Erick J. Vargas-Ordaz, Terrance Lam, Bonan Liu, Fabrizzio Horta, Michelle L. Halls, Adrian Neild, and Victor J. Cadarso
Monash University, AUSTRALIA

16:30 – 16:45

W5D.02 **FABRICATION AND DEMONSTRATION OF FILTER-FREE WAVELENGTH IMAGE SENSOR FOR VISUALIZATION OF WAVELENGTH INFORMATION**
Tomoya Ide, Yong-Joon Choi, Nakano Kakeru, Tsugumi Sakae, Ryoya Matsubara, Yasuyuki Kimura, Kensuke Murakami, Yoshiko Noda, Daisuke Akai, Takashi Hizawa, Hiromu Ishii, Kazuhiro Takahashi, Toshihiko Noda, and Kazuaki Sawada
Toyohashi University of Technology, JAPAN

Session W5D – Intelligent Bio-Chemical Sensors
Continued

Room D

16:45 – 17:00

W5D.03 **WIRELESS SOIL PH SENSING USING FULLY-DEGRADABLE SPRIT-RING-RESONATOR ARRAY WITH ISOTROPIC ELECTROMAGNETIC RESPONSE**
Ken Sakabe[1], Tetsuo Kan[2], and Hiroaki Onoe[1]
[1]*Keio University, JAPAN and* [2]*University of Electro-Communications, JAPAN*

17:00 – 17:15

W5D.04 **MOF-INTEGRATED ULTRA-BROADBAND NANOANTENNAS FOR MACHINE-LEARNING-ENABLED VOC GAS IDENTIFICATION**
Hong Zhou, Dongxiao Li, Zhihao Ren, Cheng Xu, Chan Wang, and Chengkuo Lee
National University of Singapore, SINGAPORE

17:15 – 17:30

W5D.05 **TACTILE-OLFACTORY FUSION HUMANOID HAND FOR ENVIRONMENTAL SENSING WITH FAST NONLINEAR DECISION-MAKING**
Jiachuang Wang[1,2], Xiawei Yue[1,2], Shuai Wei[1,2], Pingping Zhang[3], Nan Qin[1,2], and Tiger H. Tao[1,2,4,5,6]
[1]*Chinese Academy of Sciences (CAS), CHINA,* [2]*University of Chinese Academy of Sciences, CHINA,* [3]*Suzhou Huiwen Nanotechnology Co., Ltd, Suzhou, CHINA,* [4]*Neuroxess Co., Ltd. (Jiangxi), CHINA,* [5]*Guangdong Institute of Intelligence Science and Technology, CHINA, and* [6]*Tianqiao and Chrissy Chen Institute for Translational Research, CHINA*

17:30 – 17:45

W5D.06 **A GAS SENSOR ARRAY PACKAGED WITH A HIERARCHICAL NEURAL NETWORK FOR GAS SPECIES IDENTIFICATION AND CONCENTRATION ESTIMATION**
Zong Liu[1,2], Gabriel E. Carranza[1], Yushen Hu[1], Fei Wang[2], and Man Wong[1]
[1]*Hong Kong University of Science and Technology, CHINA and* [2]*Southern University of Science and Technology, CHINA*

Session W5E – Functional Materials & Fabrication II
Session Chairs:
Olivier Paul, *University of Freiburg, GERMANY*
Yi Chiu, *National Yang Ming Chiao Tung University, TAIWAN*

Room E

16:15 – 16:45

W5E.01 **INVITED PRESENTATION**
ADVANCED MICROFABRICATION OF PIEZOMEMS SENSORS AND ACTUATORS
Annalisa De-Pastina
Silicon Austria Labs GmbH, AUSTRIA

Session W5E – Functional Materials & Fabrication II
Continued

Room E

16:45 – 17:00

W5E.03 **STUDY ON THE POLAR ORIENTATION OF PLASMA-DEPOSITED PIEZOELECTRIC MATERIALS**
Jan-Willem Burssens[1], Chen Wang[1], Xinyu Wu[1], Jesus Gandaro-Loe[1], Appo Van der Wiel[2], and Michael Kraft[1]
[1]*KU Leuven, BELGIUM and* [2]*Melexis, BELGIUM*

17:00 – 17:15

W5E.04 **MEASURING LIGHT PENETRATION FOR SPECTRAL ANALYSIS WITH INTERCALATED GRAPHENE/QUANTUM DOT PHOTODETECTORS**
Seungbae Ahn, Ju Ying Shang, and Oscar Vazquez Mena
University of California, San Diego, USA

17:15 – 17:30

W5E.05 **ISOTROPIC DEGRADABLE METAMATERIAL FOR ENVIRONMENTAL SENSING**
Tatsuya Yano[1], Gaku Furusawa[1], Hiroaki Onoe[2], and Tetsuo Kan[1]
[1]*University of Electro-Communications, JAPAN and* [2]*Keio University, JAPAN*

17:30 – 17:45

W5E.06 **LIGHT-DRIVEN FLAGELLATED MICRO-GEL ROBOT MADE OF TEMPERATURE-RESPONSIVE HYDROGEL ACTUATOR**
Hinako Sato[1], Yoshiyuki Yokoyama[2], and Takeshi Hayakawa[1]
[1]*Chuo University, JAPAN and* [2]*Toyama Industrial Technology Research and Development Center, JAPAN*

Conference Banquet

New Hall

18:00 – 21:00

Wednesday Banquet – Calligraphy (at KICC).

THURSDAY AT A GLANCE

08:30 - 09:15	**Plenary Presentation 4** Chunhai Fan, *Shanghai Jiao Tong University (SJTU), CHINA*			
09:15 - 09:30	Transition Break			
09:30 - 10:45	Session Th2C Tissue Engineering II	Session Th2D Soft Actuators	Session Th2E Fluidic Sensors	Session Th2F Wearable Devices
10:45 - 11:15	Break			
11:15 - 12:45	Session Th3C Agricultural Applications INVITED SPEAKER	Session Th3D Actuators II INVITED SPEAKER	Session Th3E Chemical Sensors III	Session Th3F Flexible Devices & Fabrication
12:45 - 13:00	Transition Break			
13:00 - 13:30	Best Paper Award Ceremony and Closing Remarks			

THURSDAY PROGRAM

29 JUNE

Plenary Presentation 4

Session Chair:
Andreu Llobera, *Silicon Austria Labs GmbH, AUSTRIA*

Room A

08:30 - 09:15

Th1A.P4 **NUCLEIC ACIDS-BASED INFORMATION MATERIALS**
Chunhai Fan
Shanghai Jiao Tong University (SJTU), CHINA

09:15 – 09:30 Transition

Session Th2C – Tissue Engineering II

Session Chairs:
Paddy French, *TU Delft, NETHERLANDS*
Swaminathan Rajaraman, *University of Central Florida, USA*

Room A

09:30 – 09:45

Th2C.01 **ON-CHIP DIFFERENTIATION OF RADIALLY VASCULARIZED HEPATIC CORDS MIMICKING THE LIVER LOBULE**
Alan Raj Jeffrey Rajendran[1,2], Sakina Chantoiseau-Bensalem[1], Antonietta Messina[2], Nassima Benzoubir[2,3], Rasta Ghasemi[4], Jean-Charles Duclos-Vallée[2,3], and Bruno Le Pioufle[1,4]
[1]*Université Paris-Saclay, FRANCE,* [2]*Université Paris-Saclay, FRANCE,* [3]*Hôpital Paul Brousse, FRANCE, and* [4]*Université Paris-Saclay, FRANCE*

09:45 – 10:00

Th2C.02 **EXPLORING AUTONOMOUS OPTIMAL EXPERIMENTAL CONDITIONS FOR IN VITRO TISSUE MATURATION WITH BATCH BAYESIAN OPTIMIZATION**
Daiki Miyata[1], Keitaro Kasahara[1], Takahiro Yamada[1], Yuta Tokuoka[1], Yujin Taguchi[1], Yuta Kurashina[2], Akira Funahashi[1], and Hiroaki Onoe[1]
[1]*Keio University, JAPAN and* [2]*Tokyo University of Agriculture and Technology, JAPAN*

10:00 – 10:15

Th2C.03 **AUTOMATED LARGE-SCALE SPHEROID GENERATION VIA HANGING-DROP AND EFFICIENT TRANSFER INTO PHYSIOLOGICAL MIMICKING MICROENVIRONMENT**
Viktoria Zieger[1], Ellen Woehr[2,3], Stefan Zimmermann[1], Daniel Frejek[3], Peter Koltay[3], Roland Zengerle[1,3], and Sabrina Kartmann[3]
[1]*University of Freiburg, GERMANY,* [2]*University of Furtwangen, GERMANY, and* [3]*Hahn-Schickard, GERMANY*

10:15 – 10:30

Th2C.04 **MICROFLUIDIC CO-CULTURES OF CANCER SPHEROIDS AND NK CELLS FOR TESTING IMMUNOTHERAPY**
Alan M. Gonzalez-Suarez, Michael Medlyn, Daheui Choi, Gulnaz Stybayeva, Daniel D. Billadeau, and Alexander Revzin
Mayo Clinic, USA

10:30 – 10:45

Th2C.05 **APICAL MICROVILLI OF A HYBRID HIPSC-DERIVED PROXIMAL TUBULE MICROTISSUE REACT TO FLOW-INDUCED SHEAR STRESS IN A MICROPHYSIOLOGICAL SYSTEM**
Ramin Banan Sadeghian[1], Cheng Ma[1], Akihiko Kawakami[1], Minoru Takasato[1,2,3], and Ryuji Yokokawa[1]
[1]*Kyoto University, JAPAN,* [2]*Institute of Physical and Chemical Research (RIKEN), JAPAN, and* [3]*Osaka University, JAPAN*

Session Th2D – Soft Actuators

Session Chairs:
Vincent C. Lee, *National University of Singapore, SINGAPORE*
Yong Kyu Yoon, *University of Florida, USA*

Room D

09:30 – 09:45

Th2D.01 **HIGH EFFICIENCY ACTUATION CONVERSION MECHANISM FOR HIGH-OUTPUT BENDING MOTION OF A SOFT INFLATABLE MICROACTUATOR**
Yuto Hori, Seiji Suzuki, Tatsumi Katsura, and Satoshi Konishi
Ritsumeikan University, JAPAN

09:45 – 10:00

Th2D.02 **SELF-SENSING SOFT PNEUMATIC MICRO ACTUATORS FOR HAPTIC FEEDBACK AND HUMAN-MACHINE INTERFACES**
Xiayu Wang[1], Fade Hu[1], Zheng You[1], and Chuan Luo[1,2]
[1] *Tsinghua University, CHINA and* [2] *Beijing Innovation Center for Future Chips, CHINA*

10:00 – 10:15

Th2D.03 **DEPLOYABLE SOFT MICROACTUATOR WITH WATER CIRCULATION CHANNEL AND SHAPE MEMORY POLYMER**
Toshiro Yamanaka, Taosong Yu, Yuta Taniguchi, Satoshi Amaya, and Fumihito Arai
University of Tokyo, JAPAN

10:15 – 10:30

Th2D.04 **MAGNETIC CONTROLLED MULTIFUNCTIONAL THREE-DIMENSIONAL SOFT ROBOT WITH SELF-PERCEPTIVE CAPABILITY**
Chen Xu, Ji Wan, Haobin Wang, Zehua Xiang, Pengcheng Zhao, Mengdi Han, and Haixia Zhang
Peking University, CHINA

10:30 – 10:45

Th2D.05 **UNTETHERED SWARM ROBOTS WITH INDEPENDENT CRAWLING AND ROLLING MOTIONS**
Wei Yue[1], Xinyu Zhou[2], Fanping Sui[1], Mingzheng Duan[1], and Liwei Lin[1]
[1] *University of California, Berkeley, USA and* [2] *Peking University, CHINA*

Session Th2E – Fluidic Sensors

Session Chairs:
Qiao Lin, *Columbia University, USA*
Ravi Selvaganapathy, *McMaster University, CANADA*

Room E

09:30 – 09:45

Th2E.01 **A UNIVERSAL GAS SENSING CONCEPT THROUGH ACOUSTIC COUPLING IN A CAVITY**
Derin Erkan, Ahmet A. Derin, and Erdinc Tatar
Bilkent University, TURKEY

Session Th2E – Fluidic Sensors
Continued

Room E

09:45 – 10:00

Th2E.02 **HIGH QUALITY FACTOR SUSPENDED NANOCHANNEL RESONATOR DEVICES, WITH SELF-OSCILLATION CAPACITY**
Katell Aldrin[1], Thomas Furcatte[1], Georgios Katsikis[2], Guillaume Jourdan[1], Selim Olcum[3], Aurélien Lepoetre[1], Jean-François Beche[1], François Boizot[1], Marc Sansa[1], Fabrice Navarro[1], Scott Manalis[2], and Vincent Agache[1]
[1]*Université Grenoble Alpes, FRANCE,* [2]*Massachusetts Institute of Technology, USA, and* [3]*TRAVERA, USA*

10:00 – 10:15

Th2E.03 **DROPLET AS A MECHANICAL COUPLING FOR A VIBRATIONAL SYSTEM AND ITS APPLICATION IN FLUID PROPERTY SENSING**
Saravanakumar Dharmaraj and Prosenjit Sen
Indian Institute of Science, INDIA

10:15 – 10:30

Th2E.04 **AN ULTRALOW-POWER FLEXIBLE THERMAL FLOW SENSOR BASED ON ELECTROCHEMICAL IMPEDANCE**
Ke Xiao[1], Xiangyu Song[1], Mingzheng Duan[2], and Wei Xu[1]
[1]*Shenzhen University, CHINA and*
[2]*University of California, Berkeley, USA*

10:30 – 10:45

Th2E.05 **PITOT-TYPE WATERFLOW SENSOR LOGGER FOR RELATIVE WATERFLOW VELOCITY MEASUREMENT OF A SEA TURTLE**
Takuto Kishimoto[1], Ryosuke Saito[2], Hiroto Tanaka[2], Yu Naruoka[3], Kenta Kuroda[4], Katsufumi Sato[4], and Hidetoshi Takahashi[1]
[1]*Keio University, JAPAN,* [2]*Tokyo Institute of Technology, JAPAN,* [3]*Japan Aerospace Exploration (JAXA), JAPAN, and* [4]*University of Tokyo, JAPAN*

Session Th2F – Wearable Devices
Session Chairs:
Eun Sok Kim, *University of Southern California, USA*
Andreas Weltin, *University of Freiburg, GERMANY*

Room B-1

09:30 – 09:45

Th2F.01 **A BRAIN-TO-BRAIN INTERFACE WITH A FLEXIBLE NEURAL PROBE FOR MOUSE TURNING CONTROL BY HUMAN MIND**
Yifei Ye[1], Zhenyu Wang[1], Ye Tian[1,2], Han Wang[1], Cunkai Zhou[1], Honglin Hu[1], Ting Zhou[3], Zhitao Zhou[1,2], Xiaoling Wei[1,2], Jianlong Zhao[1,2], Tiger H. Tao[1,2,4,5,6,7], and Liuyang Sun[1,2]
[1]*Chinese Academy of Sciences, Shanghai, CHINA,* [2]*University of Chinese Academy of Sciences, CHINA,* [3]*Shanghai University, CHINA,* [4]*ShanghaiTech University, CHINA,* [5]*Neuroxess Co., Ltd. (Jiangxi), CHINA,* [6]*Guangdong Institute of Intelligence Science and Technology, CHINA, and* [7]*Tianqiao and Chrissy Chen Institute for Translational Research, CHINA*

Session Th2F – Wearable Devices
Continued

Room B-1

09:45 – 10:00

Th2F.02 **ULTRA-CONFORMAL TONGUE ELECTRODE ARRAY FOR TASTE PERCEPTION DECODING**
Xiner Wang[1,2], Guo Bai[3], Zhaohan Chen[4], Jizhi Liang[1,2], Qianyang Xie3, Meng Li[1,2], Xiaoling Wei[1,2], Liuyang Sun[1,2], Zhitao Zhou[1,2], and Tiger H. Tao[1,2,5,6,7]
[1]*Chinese Academy of Sciences (CAS), CHINA,* [2]*University of Chinese Academy of Sciences, CHINA,* [3]*Shanghai Ninth People's Hospital, Shanghai JiaoTong University School of Medicine, CHINA,* [4]*Shanghai Normal University, CHINA,* [5]*Neuroxess Co., Ltd. (Jiangxi), CHINA,* [6]*Guangdong Institute of Intelligence Science and Technology, CHINA, and* [7]*Tianqiao and Chrissy Chen Institute for Translational Research, CHINA*

10:00 – 10:15

Th2F.03 **A WEARABLE MULTISENSORY PULSE SENSOR BASED ON PIEZO-THERMIC TRANSDUCTION**
Shuo Tian and Rong Zhu
Tsinghua University, CHINA

10:15 – 10:30

Th2F.04 **GAIT EVENT DETECTION USING PIEZOELECTRIC FIBER EMBEDDED SMART-SOCK**
Jarred W. Fastier-Wooller[1,2], Nathan Lyons[1], Trung-Hieu Vu[1], Claudio Pizzolato[1], Toshihiro Itoh[2], Dzung Viet Dao[1], Jayishni Maharaj[1], and Van Thanh Dau[1]
[1]*Griffith University, AUSTRALIA and* [2]*University of Tokyo, JAPAN*

10:30 – 10:45

Th2F.05 **CONTINUOUS CUFFLESS MONITORING OF ARTERIAL BLOOD PRESSURE BASED ON HIGH-DENSITY FLEXIBLE SENSOR ARRAY**
Fang Wang[1,2], Heng Yang[1,2], Ke Sun[1], Yi Sun[1], and Xinxin Li[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and* [2]*University of Chinese Academy of Sciences, CHINA*

10:45 – 11:15 **Break and Exhibit Inspection**

Session Th3C – Agricultural Applications
Session Chairs:
Xiao-An "Sean" Fu, *University of Louisville, USA*
Min Wang, *Southern University of Science and Technology, CHINA*

Room A

11:15 – 11:45

Th3C.01 **INVITED PRESENTATION**
PLANT-ON-A-CHIP TECHNOLOGIES AND ITS APPLICATIONS
Hirotaka Hida
Kobe University, JAPAN

Session Th3C – Agricultural Applications
Continued

Room A

11:45 – 12:00

Th3C.03 **DEVELOPMENT OF PLANT GROWTH MONITORING SENSOR TO VISUALIZE ION DYNAMICS IN PLANTS AND ITS FUNCTIONAL VALIDATION IN LONG-TERM MEASUREMENTS**
Taichi Yoshida, Yusuke Matsushita, Naoki Sakaguchi, Yong-Joon Choi, Kazuhiro Takahashi, Kotaro Takayama, Kazuaki Sawada, and Toshihiko Noda
Toyohashi University of Technology, JAPAN

12:00 – 12:15

Th3C.04 **COMPACT CHLOROPHYLL MEASUREMENT SYSTEM FOR QUANTITATIVE ANALYSIS OF LEAF PHOTOSYNTHESIS IN AGRICULTURE**
Ryoma Mibu, Ryosuke Ichikawa, Yong-Joon Choi, Tomoya Ide, Seitaro Toda, Kazuhiro Takahashi, Kotaro Takayama, Toshihiko Noda, and Kazuaki Sawada
Toyohashi University of Technology, JAPAN

12:15 – 12:30

Th3C.05 **A PASSIVE, WIRELESS GAS SENSOR BASED ON LASER INDUCED GRAPHENE FOR SOIL AMMONIA LEVEL MONITORING**
Chao Liang[1], Wei Zhou[1], Ziqi Mei[2], Wenqiang Zhang[1], and Xiaoguang Zhao[2]
[1]*China Agricultural University, CHINA and*
[2]*Tsinghua University, CHINA*

12:30 – 12:45

Th3C.06 **HIGH-SPEED ON-CHIP IN-LIQUID DISPENSING BY UTILIZING ON-DEMAND VORTX GENERAIONS**
Makoto Saito, Yoko Yamanishi, and Shinya Sakuma
Kyushu University, JAPAN

Session Th3D – Actuators II
Session Chair:
Rakesh Chand, *Vanguard International Semiconductor Corporation, SINGAPORE*
Jungyul Park, *Sogang University, KOREA*

Room D

11:15 – 11:45

Th3D.01 **INVITED PRESENTATION**
ZERO-POWER OPTOMECHANICAL ACTUATORS
Behraad Bahreyni
Simon Fraser University, CANADA

11:45 – 12:00

Th3D.03 **DESIGN OF BI-DIRECTIONAL VO_2-KIRIGAMI ELECTROTHERMAL MICROACTUATOR WITH MILLIMETER LARGE STROKE**
Masaaki Hashimoto, Tomoya Tsutsui, and Yoshihiro Taguchi
Keio University, JAPAN

Session Th3D – Actuators II

Continued

Room D

12:00 – 12:15

Th3D.04 **BANDWIDTH ENHANCEMENT OF PIEZOELECTRIC MEMS MICROSPEAKER BY MULTIPLE PISTON-MODES AND NOVEL CROSSOVER DRIVING METHOD**

Ting-Chou Wei[1], Hsu-Hsiang Cheng[1], Sung-Cheng Lo[2], Yu-Chen Chen[1], Shu-Wei Chang[1], Zih-Song Hu[1], Jerwei Hsieh[3], Ruey-Shing Huang[3,4], and Weileun Fang[1]

[1]*National Tsing Hua University, TAIWAN,* [2]*Upbeat Technology Co., Ltd., TAIWAN,* [3]*Asia Pacific Microsystem Inc., TAIWAN, and* [4]*National Sun Yat-sen University, TAIWAN*

12:15 – 12:30

Th3D.05 **A MECHANICALLY-OPEN AND ACOUSTICALLY-CLOSED PIEZO-MEMS SPEAKER FOR IN-EAR APPLICATIONS**

Chiara Gazzola[1], Valentina Zega[1], Fabrizio Cerini[2], Silvia Adorno[2], and Alberto Corigliano[1]

[1]*Politecnico di Milano, ITALY and* [2]*STMicroelectronics, ITALY*

12:30 – 12:45

Th3D.06 **WIRELESS ACOUSTIC AIRBORNE JET PROPELLER**

Akash Roy, Matin Barekatain, Jaehoon Lee, Baptiste Neff, and Eun Sok Kim

University of Southern California, USA

Session Th3E – Chemical Sensors III

Session Chair:

Luis Velasquez-Garcia, *Massachusetts Institute of Technology, USA*

Pengcheng Xu, *Chinese Academy of Sciences (CAS), CHINA*

Room E

11:15 – 11:30

Th3E.01 **MICROFLUIDIC-BASED DIFFRACTED X-RAY TRACKING METHOD FOR REAL-TIME OBSERVATION OF ION CHANNEL TWIST MOTION UNDER SEQUENTIAL CHEMICAL STIMULI**

Kentaro Kotoya[1], Ikkei Yamauchi[1], Hirofumi Shimizu[2], and Yoshikazu Hirai[1]

[1]*Kyoto University, JAPAN and* [2]*University of Fukui, JAPAN*

11:30 – 11:45

Th3E.02 **A METAL ORGANIC FRAMEWORK DERIVED NANO POROUS CARBON (NPC)-MWCNT HETEROSTRUCTURED NANOCOMPOSITE-BASED ELECTROCHEMICAL SENSING PATCH FOR SWEAT Ca ION AND pH MONITORING**

Md Asaduzzaman, Md Abu Zahed, Md Selim Reza, Seong Hoon Jeong, Hyesu Song, and Jae Yeong Park

Kwangwoon University, KOREA

Session Th3E – Chemical Sensors III
Continued

Room E

11:45 – 12:00

Th3E.03 **HIGHLY CONDUCTIVE AND ENVIROMENTALLY STABLE MXENE-$Ti_3C_2T_x$ NANOSHEETS FOR MULTIPLEXED DISEASE INFLAMMATORY BIOMARKER DETECTION**
Md Selim Reza, Md Sharifuzzaman, Md Asaduzzaman, Seong Hoon Jeong, Hye Su Song, and Jae Yeong Park
Kwangwoon University, KOREA

12:00 – 12:15

Th3E.04 **ELECTRICAL DETECTION OF DNA NANOBALLS USING IMPEDANCE SPECTROSCOPY IN A MICROFLUIDIC CHIP**
Muhammad Tayyab[1], Donal Barrett[2], Gijs van Riel[2], Shujing Liu[2], Björn Reinius[2], Curt Scharfe[3], Peter Griffin[4], Lars Steinmetz[4], Vicent Pelechano[2], and Mehdi Javanmard[1]
[1]*Rutgers, State University of New Jersey, USA,* [2]*Karolinska Institute, SWEDEN,* [3]*Yale University, USA, and* [4]*Stanford University, USA*

12:15 – 12:30

Th3E.05 **MONOLITHIC FABRICATION OF NANO GAP ELECTRODES FOR SINGLE-MOLECULE BIOSENSING**
Ashesh Ray Chaudhuri[1], Chulmin Choi[2], Raymond Lobaton[2], Drew A. Hall[3], Prem Sinha[2], Manoj Jaysankar[1], Philippe Helin[1], Carl W. Fuller[2], Paul W. Mola[2], Barry Merriman[2], and Simone Severi[1]
[1]*IMEC, BELGIUM,* [2]*Roswell ME, USA, and* [3]*University of California, San Diego, USA*

12:30 – 12:45

Th3E.06 **DEVELOPMENT OF AC NANOPORE MESUREMENT METHOD AND MICROBIAL IDENTIFICATION CONBINATED WITH MACHINE LEARNING**
Maami Sakamoto, Kosuke Hori, Ayaka Nakama, and Takatoki Yamamoto
Tokyo Institute of Technology, JAPAN

Session Th3F – Flexible Devices & Fabrication
Session Chair:
Xiaomei Yu, *Peking University, CHINA*
Erdinç Tatar, *Bilkent University, TURKEY*

Room B-1

11:15 – 11:30

Th3F.01 **HIGHLY SENSITIVE AND STRETCHABLE STRAIN SENSOR BASED ON SILVER NANOWIRE/GRAPHENE HYBRID WITH A NEAR-ZERO THERMAL CROSSTALK**
Leilei Wang and Jungwook Choi
Chung-Ang University, KOREA

Session Th3F – Flexible Devices & Fabrication

Continued

Room B-1

11:30 – 11:45

Th3F.02 **LOCALIZED BIOMECHANICAL STRAIN SENSING WITH HIGHLY FLEXIBLE PIEZORESISTIVE GRAPHENE/SU-8 NANOCOMPOSITE ACTIVE LAYER**

Faizan Tariq Beigh[1], Shivam Jaisawal[2], Mujeeb Yousuf[3], Nadeem Tariq Beigh[1], Pushpapraj Singh[3], and Dhiman Mallick[1]

[1] *Indian Institute of Technology Delhi, INDIA,* [2] *Defense Institute of Advanced Technology (DIAT), INDIA, and* [3] *Centre for Applied Research in Electronics (CARE), INDIA*

11:45 – 12:00

Th3F.03 **STRETCHABLE PEDOT: PSS-PRINTED FABRIC STRAIN SENSOR FOR HUMAN MOVEMENT MONITORING AND RECOGNITION**

Caise Wei, Jinfeng Yuan, Yuzhong Zhang, and Rong Zhu

Tsinghua University, CHINA

12:00 – 12:15

Th3F.04 **PLANAR METASTRUCTURE-BASED GAS SENSORS FOR HIGH STRETCHABILITY AND STABLE NO_2 SENSING**

Jeonheyong Park, Hyeoncheol Lim, Chaehyun Ryu, Soon In Jung, Il Ryu Jang, and Hoe Joon Kim

Daegu Gyeongbuk Institute of Science and Technology (DGIST), KOREA

12:15 – 12:30

Th3F.05 **MULTIFUNCTIONAL STRETCHABLE SENSOR FOR MONITORING HUMAN MOTION**

Yuzhong Zhang, Jinfeng Yuan, Caise Wei, and Rong Zhu

Tsinghua University, CHINA

12:30 – 12:45

Th3F.06 **IN-TUBE-CENTER PACKAGING OF FLEXIBLE MEMS AIRFLOW-RATE SENSOR AND ITS SENSITIVITY ENHANCEMENT**

Muhammad Salman Al Farisi[1], Yang Wang[1], Yoshihiro Hasegawa[1], Miyoko Matsushima[2], Tsutomu Kawabe[2], and Mitsuhiro Shikida[1]

[1] *Hiroshima City University, JAPAN and* [2] *Nagoya University, JAPAN*

12:45 – 13:00 **Transition**

Best Paper Award Ceremony and Closing Remarks

Room A

13:00 – 13:30

13:30 **Conference Adjourns**

POSTER PRESENTATIONS

EVENT HALL

MONDAY	TUESDAY	WEDNESDAY
14:00 – 16:00	14:15 – 16:15	14:15 – 16:15

POSTER CATEGORIES

- Actuators and Microsystems
- Bio-Sensors and Microsystems Including In-Vitro Medical Applications
- Chemical Sensors and Microsystems
- Composite Materials, Polymers, and Fabrication Processes
- Energy, Power and Thermal Management
- Microfluidics Platform Technologies
- Nanoscale Materials and Fabrication
- Optical and Atomic Transducers
- Packaging & Solid-State Materials and Fabrication Processes
- Physical Sensors and Microsystems
- RF MEMS, Resonators and Oscillators
- Wearable and In-Vivo Medical Devices and Microsystems
- Late News

MONDAY - Actuators and Microsystems

M4P.001 **ALN-BASED PMUT ARRAYS FOR DEXTEROUS CELL HANDLING**
Bart P. Weekers[1,2], Liesbet Lagae[1,2], Xavier Rottenberg[2], and Veronique Rochus[2]
[1]*KU Leuven, BELGIUM and* [2]*imec, BELGIUM*

M4P.002 **ASYMMETRICAL PMUTS FOR FOCUSED ACOUSTIC PRESSURE BY REINFORCEMENT LEARNING**
Wei Yue[1], Fanping Sui[1], Yande Peng[1], Fan Xia[1], Peggy Tsao[1], Megan Teng[1], Hanxiao Liu[2], and Liwei Lin[1]
[1]*University of California, Berkeley, USA and*
[2]*Tsinghua University, CHINA*

M4P.003 **DEVELOPMENT, REALIZATION AND VALIDATION OF A PIEZOELECTRIC FLEXIBLE HAPTIC INTERFACE**
Romain Le Magueresse[1,2], Fabrice Casset[1], Frédéric Giraud[2], Munique Kazar Mendes[1], Sébastien Brulais[1], Laure Peris Y Saborit[1], Anis Kaci[2], and Mikael Colin[1]
[1]*Université Grenoble Alpes, FRANCE and*
[2]*Université de Lille, FRANCE*

M4P.004 **FABRICATION AND PERFORMANCE EVALUATION OF 61-ELECTRODE PIEZOELECTRIC MEMS DEFORMABLE MIRROR BASED ON PZT FILM**
Junhua Wang, Cao Xia, Yuanlin Xia, Liang He, and Zhuqing Wang
Sichuan University, CHINA

M4P.005 **HIGH OUTPUT TACTILE DISPLAY USING SMA THICK FILM ACTUATOR ARRAY WITH IMPROVED THERMAL AND FREQUENCY RESPONSE**
Ryo Saito, Haruto Amano, and Takashi Mineta
Yamagata University, JAPAN

M4P.006 **DESIGN AND FABRICATION OF A 4-TERMINAL IN-PLANE NANOELECTROMECHANICAL RELAY**
Yingying Li[1], Simon J. Bleiker[1], Pierre Edinger[1], Elliott Worsey[2], Mukesh Kumar Kulsreshath[2], Qi Tang[2], Alain Yuji Takabayashi[3], Niels Quack[3], Peter Verheyen[4], Wim Bogaerts[4,5], Kristinn B. Gylfason[1], Dinesh Pamunuwa[2], and Frank Niklaus[1]
[1]*KTH Royal Institute of Technology, SWEDEN,* [2]*University of Bristol, UK,* [3]*École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND,* [4]*IMEC, BELGIUM, and* [5]*University of Ghent, BELGIUM*

M4P.007 **LESS RESONANT FREQUENCY SHIFT AND MINOR SPL ATTENUATION OF PZT MEMS SPEAKER ACHIEVED BY RIB-REINFORCED DIAPHRAGM**
Hsu-Hsiang Cheng[1], Sung-Cheng Lo[1], Ting-Chou Wei[1], Mingching Wu[2], and Weileun Fang[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*CoretronicMEMS Co., Ltd., TAIWAN*

M4P.008 **ORIGAMI-INSPIRED FLEXURE-BASED ROBOT FOR ENDOMICROSCOPY PROBE MANIPULATION**
Xu Chen, Jinshi Zhao, Khushi Vyas, Michail E. Kiziroglou, and Eric M. Yeatman
Imperial College London, UK

M4P.009 **PZT MEMS TUNABLE LIQUID LENS WITH INTEGRATED PIEZORESISTIVE POSITION SENSORS**
Zhengnan Tang[1], Leo Soda[1,2], Taiyu Okatani[1], Andrea Vergara[1], Yukio Suzuki[1], and Shuji Tanaka[1]
[1]*Tohoku University, JAPAN and*
[2]*École des Mines de Saint-Étienne, FRANCE*

TUESDAY - Actuators and Microsystems

T4P.001 **2-DOF MEMS MIRROR WITH LARGE MECHANICAL ANGLES USING ONE MAGNETIC FIELD FOR CLOSE RANGE SCANNING APPLICATIONS**
Dang D.H. Tran[1], Ludovic Rapp[2], Steve Madden[2], Laurence J. Walsh[3,5], Heiko Spallek[4], Lee Walsh[6], Andrew Sutton[2], Omar Zuaiter[5], Alaa Habeb[5], and Timothy R. Hirst[5]
[1]*Griffith University, AUSTRALIA,* [2]*Australian National University, AUSTRALIA,* [3]*University of Queensland School of Dentistry, AUSTRALIA,* [4]*University of Sydney School of Dentistry, AUSTRALIA,* [5]*Dentroid (Emudent Technologies Pty Ltd), AUSTRALIA, and* [6]*Platypus Technical Consultants Pty Ltd, AUSTRALIA*

T4P.002 **3D-PRINTED MICRO-MANIPULATOR WITH COMPLIANT MECHANISM FOR BIOLOGICAL APPLICATION**
Masaru Mukai[1], Yukihito Moritoki[1], Takayuki Yamada[2], Shinji Nishiwaki[3], Tomoyuki Shimono[1], Tatsuto Kageyama[1,4], Junji Fukuda[1,4], and Shoji Maruo[1]
[1] *Yokohama National University, JAPAN,* [2] *University of Tokyo, JAPAN,* [3] *Kyoto University, JAPAN, and* [4] *Kanagawa Institute of Industrial Science and Technology (KISTEC), JAPAN*

T4P.003 **A 3D SELF-ROLL INDUCTOR BASED ON AL-SiO_2 BIMORPHS**
Hengzhang Yang[1], Jian Gao[1], Yingtao Ding[1], Yuwen Su[1], YangYang Yan[2], and Huikai Xie[1,2]
[1] *Beijing Institute of Technology, CHINA and* [2] *BIT Chongqing Institute of Microelectronics and Microsystems, CHINA*

T4P.004 **BENDABLE POLYMER-BASED HIGH-FREQUENCY PMUTS ON TRANSPARENT SU8 AND POLYIMIDE SUBSTRATES**
Sanjog V. Joshi, Sina Sadeghpour, and Michael Kraft
KU Leuven, BELGIUM

T4P.005 **CROSSTALK EFFECTS IN PMUT ARRAYS**
Omer M. O. Abdalla[1], Gianluca Massimino[1], Cristina D'Argenzio[1], Matteo Colosio[1], Marco Soldo[2], Fabio Quaglia[2], and Alberto Corigliano[1]
[1] *Politecnico di Milano, ITALY and* [2] *STMicroelectronics, ITALY*

T4P.006 **DEVELOPMENT OF PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCER WITH DUAL HETEROGENEOUS PIEZOELECTRIC THIN FILM STACKING**
Xuanmeng Qi[1], Shinya Yoshida[2], Mohssen Moridi[3], Sarah Risquez[3], Anirban Ghosh[3], and Shuji Tanaka[1]
[1] *Tohoku University, JAPAN,* [2] *Shibaura Institute of Technology, JAPAN, and* [3] *Silicon Austria Labs, AUSTRIA*

T4P.007 **ELECTRO-FORCE DISPLAY FOR NANO ROBOTICS**
Kain Ichinohe, Ken Sasaki, and Takayuki Hoshino
Hirosaki University, JAPAN

T4P.008 **HIGHLY MINIATURIZED IN-EAR MEMS LOUDSPEAKER FEATURING HIGH SPL**
Fabian Stoppel, Johannes Fankhänel, Thorsten Giese, Christian Eisermann, Isa Pieper, Dirk Kaden, Lenny Castellanos, and Sven Gruenzig
Fraunhofer Institute for Silicon Technology, GERMANY

T4P.009 **MICRO-FABRICATED BI-STABLE MECHANICAL SWITCH ACTUATED BY SINGLE THERMAL ACTUATOR**
Jiacheng Liu[1], Yuma Ohara[2], Zerui Xu[2], Ruizi Liu[1], Zhangshanhao Li[2], Xiaohong Wang[3], Toshiyuki Tsuchiya[2], and Man Wong[1]
[1] *Hong Kong University of Science and Technology, Hong Kong, CHINA,* [2] *Kyoto University, JAPAN, and* [3] *Tsinghua University, CHINA*

T4P.010 **ON THE USE OF 3D-PRINTED ULTRASONIC HORNS TO TUNE THE FREQUENCY RESPONSE OF AIRBORNE MEMS TRANSDUCERS**
Gabriele Bosetti, Stefan Hofstetter-Spona, and Gabriele Schrag
Technical University of Munich, GERMANY

W4P.002 **CENTIMETER-SCALE CULTURED WHOLE-CUT CHICKEN MEAT FABRICATED USING A MICROFABRICATED HOLLOW FIBER BIOREACTOR**
Minghao Nie, Ai Shima, and Shoji Takeuchi
University of Tokyo, JAPAN

W4P.003 **DEVELOPMENT OF HAPTIC BIO-FEEDBACK RING USING ULTRA-THIN HAPTIC MEMS FILM**
Toshihiro Takeshita, Zymelka Daniel, Yusuke Takei, and Takeshi Kobayashi
National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

W4P.004 **FABRICATION PROCESS OF CONVENTIONAL AND UNCONVENTIONAL 3D MICROCOILS BASED ON 2D ARRAY OF SU-8 MICROPOSTS STRUCTURE**
Emil R. Mamleyev[1], Manfred Kohl[1], Jan G. Korvink[1], and Kirill V. Poletkin[2]
[1]*Karlsruhe Institute of Technology (KIT), GERMANY and*
[2]*Hefei University of Technology, CHINA*

W4P.005 **HAPTIC INTERFACE BASED ON AN INNOVATIVE "PIEZO-IN-FLEX" PIEZOELECTRIC PATCH TECHNOLOGY**
Fabrice Casset, Munique Kazar Mendes, Nadine David, Rémi Franiatte, Daniel Mermin, Marc Zussy, Jérôme Dechamp, Laetitia Castagné, Jean-Charles Souriau, Kevin Benedetto, and Mikael Colin
University Grenoble Alpes, FRANCE

W4P.006 **LEAD FREE KNN THIN FILMS BASED ACTUATOR DEVICES REALIZED IN A 200 MM SILICON TECHNOLOGY FOR PIEZOELECTRIC TRANSDUCER APPLICATIONS**
Hugo Kuentz[1,2], Alain Campo[1], Christel Dieppedale[1], Christophe Poulain[1], Maryline Guilloux-Viry[2], and Gwenael Le Rhun[1]
[1]*Université Grenoble Alpes, FRANCE and*
[2]*Université de Rennes, FRANCE*

W4P.007 **MULTIMODE MEMS MIRROR FOR HOMOGENEOUS ILLUMINATION IN RESONANT SCANNING OPERATION**
Markus Bainschab, Rodrigo T. Rocha, Clément Fleury, Takashi Sasaki, Sara Guerreiro, Anton Lagosh, and Adrien Piot
Silicon Austria Labs GmbH (SAL), AUSTRIA

W4P.008 **ON MEMS WAFER ASSESSMENT FOR SWITCHING DEVICES EXPOSED TO DIRECT METAL-CONTACTS AND THERMAL HISTORIES**
Sushil Kumar[1], Dhairya Singh Arya[2], Manu Garg[1], and Pushpapraj Singh[1]
[1]*Indian Institute of Technology Delhi, INDIA and*
[2]*CSIR – Central Scientific Instruments Organisation (CSIO), INDIA*

W4P.009 **PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCER ENABLES BUBBLE-BASED STIRRING AND RECONFIGURABLE PARTICLE PATTERNING**
Xianbin Li[1], Jingui Qian[1,2], Junjie Zhang[1], Bowei Zhang[1], Joshua E.-Y. Lee[2], and Wei Zhang[1]
[1]*Hefei University of Technology, CHINA and*
[2]*City University of Hong Kong, HONG KONG*

W4P.010 **WIRELESS CRAWLING OF INCHWORM-LIKE ROBOT BY INDUCTION HEATING**
Woojun Jung, Seonghyeon Lee, and Yongha Hwang
Korea University, KOREA

MONDAY
Bio-Sensors and Microsystems Including In-Vitro Medical Applications

M4P.010 **A MICROFLUIDIC FLOW CYTOMETRY WITH A UNIFORM OPTICAL FIELD ENABLING QUANTITATIVE ANALYSIS OF SINGLE-CELL PROTEINS WITH ARBITRARY DISTRIBUTIONS**
Ting Zhang[1,2], Lixing Liu[1,2], Yuanchen Wei[1], Chiyuan Gao[1,2], Liangliang Ma[3], Mengge Gao[4], Xiaosu Zhao[4], Yixiang Wang[5], Deyong Chen[1,2], Lichao Sun[3], Junbo Wang[1,2], and Jian Chen[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA,* [2]*University of Chinese Academy of Sciences, CHINA,* [3]*Cancer Hospital Chinese Academy of Medical Sciences, CHINA,* [4]*National Clinical Research Center for Hematologic Disease, CHINA, and* [5]*Peking University Hospital of Stomatology, CHINA*

M4P.011 **A ZnO-BASED AUTOMATED ELECTRONIC NOSE FOR VOCs DETECTION WITH HIGH-SENSITIVITY MODULATED FRONT-END ELECTRONICS**
Bianca Di Diodoro[1], Carmen Bax[1], Roberto Bernasconi[1], Alessandro Ticozzi[1], Luca Magagnin[1], Gianluigi Taverna[2], Fabio Grizzi[3], Giacomo Langfelder[1], and Laura Capelli[1]
[1]*Politecnico di Milano, ITALY,* [2]*Humanitas Mater Domini Hospital, ITALY, and* [3]*IRCCS Humanitas Research Hospital, ITALY*

M4P.012 **ASYMMETRICAL TITANIUM OXIDE PATTERNS FOR UNIDIRECTIONAL CELL GUIDANCE**
Yijun Cheng and Stella W. Pang
City University of Hong Kong, CHINA

M4P.013 **AUTOMATIC VASCULAR LOCALIZATION WITH A FLEXIBLE TACTILE SENSING DENSE-ARRAY**
Yi Sun[1], Fang Wang[1,2], Ke Sun[1], Heng Yang[1,2], and Xinxin Li[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

M4P.014 **COMPACT LSPR BIOSENSOR SYSTEM FOR EARLY VIRUS DETECTION INTEGRATED WITH A FILTER-FREE WAVELENGTH SENSOR AND LED**
Tsugumi Sakae, Yong-Joon Choi, Tomoya Ide, Kazuhiro Takahashi, Toshihiko Noda, and Kazuaki Sawada
Toyohashi University of Technology, JAPAN

M4P.015 **DEVELOPMENT OF A HIGH SENSITIVITY, WIDE RANGE CMOS CAPACITIVE DNA SENSOR ARRAY**
Po-Hsuan Lai, Lien-Sing Tseng, Chia-Min Yang, and Michael S.-C. Lu
National Tsing Hua University, TAIWAN

M4P.016 **ELECTROCHEMICAL BIOSENSOR BASED ON DISPOSABLE PAPER-BASED LASER-INDUCED GRAPHENE**
Panpan Gao, Toshihiro Kasama, Jungchan Shin, Yixuan Huang, Madoka Takai, and Ryo Miyake
University of Tokyo, JAPAN

M4P.017 **IN-VITRO TUMOR AND MICROENVIRONMENT RECONSTRUCTION LABCHIP APPLIED TO HIPEC DRUG SCREENING**
Jing-Wen Guo[1], Chin-Yung Hsu[1], Zhi-Yin Chao[1], Mao-Chih Hsieh[2], Yu-ting Tai[2], Hwan-You Chang[1], Si-Jin Dong[1], and Cheng-Hsien Liu[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*Taipei Medical University, TAIWAN*

M4P.018 **LUNG ON CHIP WITH AIR-LIQUID INTERFACE FOR STUDYING AIR POLLUTION AND IDIOPATHIC PULMONARY FIBROSIS**
Tsan-Yang Tsai[1], Yi-Ting Ke[1], Yu-Che Chueh[1], Kang-Yun Lee[2], Hsiao-Chi Chuang[2], Wei-Lun Sun[1], and Cheng-Hsien Liu[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*Taipei Medical University, TAIWAN*

M4P.019 **MACHINE LEARNING ASSISTED LARGE AREA CELL TRACTION STRESS MEASUREMENTS OF CONTINUOUS CELL SHEETS**
Xing Haw Marvin Tan[1,2], Tomohiro Yokota[1], Arjun Deb[1], and Pei-Yu Chiou[1]
[1]*University of California, Los Angeles, USA and* [2]*Agency for Science, Technology and Research (A*STAR), SINGAPORE*

M4P.020 **MICROFLUIDIC THERMAL MODEL FOR EARLY DETECTION OF INFECTION IN AORTIC GRAFTS**
Signe L.K. Vehusheia[1], Cosmin I. Roman[1], Nikola Cesarovic[1,2], and Christofer Hierold[1]
[1]*ETH Zürich, SWITZERLAND and*
[2]*German Heart Center Berlin, GERMANY*

M4P.021 **MULTI-WAVELENGTH OPTOELECTRONIC SYSTEM WITH MACHINE LEARNING FOR ONLINE HEMODIALYSIS MONITORING**
Yao-Te Wang[1], Yi-Ting Chen[2], Fong-Shung Huang[2], Shuei-Liong Lin[2], Yu-Hsiang Chou[2], Cheng-Che Hsu[1], and Yen-Wen Lu[1]
[1]*National Taiwan University, TAIWAN and*
[2]*National Taiwan University Hospital, TAIWAN*

M4P.022 **MULTIFUNCTIONAL WOUND DRESSING PATCH FOR ADVANCED WOUND CARE**
Ji-Hwan Ha[1,2], Junseong Ahn[1,2], Yongrok Jeong[1], Byeongmin Kang[1], Jun-Ho Jeong[2], and Inkyu Park[1]
[1]*Korea Advanced Institute of Science and Technology (KAIST), KOREA and* [2]*Korea Institute of Machinery and Materials, KOREA*

M4P.023 **OXYGEN DETECTION OF SINGLE CELLS WITH GUIDED MOVEMENTS**
Muting Wang and Stella W. Pang
City University of Hong Kong, CHINA

M4P.024 **NOVEL MICROFLUDIC DEVICE FOR EFFECTIVE ISOLATION OF CIRCULATING TUMOR CELLS BY USING MAGNETIC PEARL-LIKE BEAD-CHAIN STRUCTURES**
Sasi Kiran Boilla, Yi-Cheng Tsai, and Gwo-Bin Lee
National Tsing Hua University, TAIWAN

TUESDAY
Bio-Sensors and Microsystems Including In-Vitro Medical Applications

T4P.011 **A 3D ENGINEERED PLATFORM FOR FUNCTIONAL MONITORING OF IN VITRO BRAIN MODELS**
Ali Maziz[1], Eduardo Martinez Marin[1], Venkata Suresh Vajrala[1], Asma Eddarir[1], Sophie Pautot[2], and Christian Bergaud[1]
[1] *CNRS, FRANCE and* [2] *SYNAXYS Neuro Engineering Systems, FRANCE*

T4P.012 **A NOVEL SPECTRAL PLATFORM FOR QUANTIFYING UROBILINOGEN USING A URINE DIPSTICK**
Ciao-Ming Tsai[1], Jyun-Wei Wen[1], Wei-Yi Kong[2], Wei-Huai Chiu[2], Weileun Fang[1], and Cheng-Hao Ko[2]
[1] *National Tsing Hua University, TAIWAN and* [2] *National Taiwan University of Science and Technology, TAIWAN*

T4P.013 **QUANTITATIVE CELL MIGRATION MONITORING METHOD USING RETROREFLECTIVE JANUS PARTICLES**
Eun Kyeong Yang, Kyung Won Lee, and Hyun Chul Yoon
Ajou University, KOREA

T4P.014 **ACTIVE STROBE IMAGER THAT CAN MEASURE MECHANICAL IMPEDANCE BY USING INPHASE OPERATIONAL MODE**
Taiki Yamaguchi[1], Osamu Fukuda[1], Hideaki Ito[1], Kensuke Harada[2], Koji Mizoue[4], and Makoto Kaneko[3]
[1] *Saga University, JAPAN,* [2] *Osaka University, JAPAN,* [3] *Meijo University, JAPAN, and* [4] *Mizoue Project Japan Corp., JAPAN*

T4P.015 **AN SPR MICROFLUIDIC DEVICES FOR IDENTIFICATION OF HUMAN HERPESVIRUS 4 AND SARS-COV-2**
Han-Yun Hsieh[1], Ray Chang[1], Er-Yuan Chuang[2], Yu-Jui Fan[2], Pei-Kuen Wei[3], and Horn-Jiunn Sheen[1]
[1] *National Taiwan University, TAIWAN,* [2] *Taipei Medical University, TAIWAN, and* [3] *Academia Sinica, TAIWAN*

T4P.016 **FILLING SYSTEM OF CELL-LADEN HYDROGELS IN A PDMS MICROARRAY FOR ANALYZING MULTIPLE WELLS IN ONE-SHOT OF A MICROSCOPE**
Kazuki Nishimoto, Haruka Oda, and Shoji Takeuchi
University of Tokyo, JAPAN

T4P.017 **ULTRASOUND TRIGGERED BUBBLE-INDUCED BLOOD-BRAIN BARRIER OPENING: A MONODISPERSE MICROBUBBLE AND ORGAN ON-CHIP STUDY**
Mariia Zakharova, Martin R.P. van den Broek, Loes I. Segerink, and Tim Segers
University of Twente, NETHERLANDS

T4P.018 **INVESTIGATION OF FLOW-INDUCED INTRACELLULAR Ca2+ INCREASE IN PROXIMAL TUBULE CELLS ON A MICROPHYSIOLOGICAL SYSTEM FOR ADPKD MODELING**
Cheng Ma, Ramin Banan Sadeghian, Kazuya Fujimoto, Akihiko Kawakami, Toshikazu Araoka, and Ryuji Yokokawa
Kyoto University, JAPAN

T4P.019 **LOCAL REMOVAL TECHNIQUE OF MICROBUBBLES IN MICROFLUIDIC DEVICE THROUGH PDMS THIN WALL FOR TISSUE CULTURE**
Yasunori Tokuoka[1], Noboru Nakaigawa[2], Keiichi Kondo[2], and Tadashi Ishida[1]
[1] *Tokyo Institute of Technology, JAPAN and* [2] *Yokohama City University, JAPAN*

T4P.020 **MEMS-BASED ULTRA-HIGH FREQUENCY WIRELESS 10X10 QCM BIOSENSOR ARRAY CHIP**
Fumihito Kato[1], Junki Shinohara[1], Manabu Yoshino[1], Manabu Suzuki[1], and Hirotsugu Ogi[2]
[1] *Nippon Institute of Technology, JAPAN and* [2] *Osaka University, JAPAN*

T4P.021 **MICROFLUIDIC DETECTION OF < 400 CFU/ML *E. COLI* IN WHOLE BLOOD WITHIN ONE HOUR**
Henar Marino Miguélez[1], Sara Cabanas Altarriba[1], Jimmy Larsson[2], Johan Elf[2], and Wouter M. van der Wijngaart[1]
[1] *KTH Royal Institute of Technology, SWEDEN and*
[2] *Uppsala University, SWEDEN*

T4P.022 **MICROWELLS WITH CONNECTING CHANNEL TO MODEL METASTATIC BEHAVIOR OF NASOPHARYNGEAL CARCINOMA CELLS**
Xiao Hong, Yuanhao Xu, and Stella W. Pang
City University of Hong Kong, CHINA

T4P.023 **SERS DETECTION OF SINGLE METHYLATED ANDENINE IN A DNA OLIGOMER**
Hiroki Ito, Tomoya Shinabe, Akio Uesugi, Koji Sugano, and Yoshitada Isono
Kobe University, JAPAN

T4P.024 **SENSING BEYOND THE DEBYE LENGTH: DEVELOPMENT OF A HIGHLY SENSITIVE, WIDE-RANGE CMOS DNA SENSOR ARRAY**
Lien-Sing Tseng, Po-Hsuan Lai, Chia-Min Yang, and Michael S.-C. Lu
National Tsing Hua University, TAIWAN

T4P.025 **PERITONEAL TUMOR MICROENVIRONMENT LABCHIP FOR THE SELECTION OF HIPEC DRUGS**
Yin-Shan Chien[1], Chia-Peng Wang[1], Mao-Chih Hsieh[2], Yu-Ting Tai[2], Jen-Tsan Ashley Chi[3], Si-Jin Don[1], and Cheng-Hsien Liu[1]
[1] *National Tsing Hua University, TAIWAN,* [2] *Taipei Medical University, TAIWAN, and* [3] *Duke University, USA*

WEDNESDAY
Bio-Sensors and Microsystems Including In-Vitro Medical Applications

W4P.011 **A CORAL-ON-A-CHIP MICROFLUIDIC PLATFORM ENABLING METABOLIC ANALYSIS OF A SINGLE CORAL POLYPS**
Chien-Ting Kuo, Pei-Heng Tai, and Shih-hao Huang
National Taiwan Ocean University, TAIWAN

W4P.012 **A FULLY PACKAGED MICROFLUIDIC THERMAL BIOSENSOR DESIGNED BASED ON MEMS TECHNOLOGY AND ITS ENZYME IMMOBILIZATION**
Zhen Peng, Cao Xia, Yuanlin Xia, Liang He, and Zhuqing Wang
Sichuan University, CHINA

W4P.013 **A HIGHLY EFFICIENT MICROFLUIDIC U–WELL ARRAY DEVICE FACILITATING HIGH-THROUGHPUT METASTATIC TUMOR SPHEROID CULTURE AND DRUG EVALUATION**
Yu-Hsuan Cheng, Yi-Shan Huang, Meng-Hsun Wu, Ming-Hong Tai, and Ching-Te Kuo
National Sun Yat-sen University, TAIWAN

W4P.014 **A NOVELTY ULTRA-MICRO SPECTRUM MEASUREMENT PLATFORM FOR MELAMINE DETECTION IN BIO-CHEMICAL APPLICATION**
Wei-Yi Kong[1], Wei-Huai Chiu[1], Ciao-Ming Tsai[2], Guan-Yi Lin[3], Weileun Fang[2], Chitsung Hong[3], and Cheng-Hao Ko[1]
[1]*National Taiwan University of Science and Technology, TAIWAN,* [2]*National Tsing Hua University, TAIWAN, and* [3]*SpectroChip Inc., TAIWAN*

W4P.015 **CYLINDRICAL NEURAL ELECTRODES USING PRE-SHAPED FLEXIBLE PRINTED CIRCUIT MADE OF LIQUID CRYSTAL POLYMER**
Taichi Ishikawa[1], Yoshiaki Sakai[1], Noriko Tsuruoka[1], Hajime Mushiake[1], Tomokazu Ohshiro[1], Makoto Osanai[2], and Yoichi Haga[1]
[1]*University of Tohoku, JAPAN and* [2]*Osaka University, JAPAN*

W4P.016 **ELECTROPHYSIOLOGICAL CHARACTERIZATON OF A NOVEL, TRANSWELL-TRANSFERRED, HUMAN NEURAL NOCICEPTIVE MICROPHYSIOLOGICAL CIRCUIT ATOP POLYMER/STEEL 3D MICROELECTRODE ARRAYS**
Charles M. Didier[1], Kevin J. Pollard[2], Alexander Bosak[2], Nisha Iyer[3], Randolph S. Ashton[3], Michael J. Moore[2], and Swaminathan Rajaraman[1]
[1]*University of Central Florida, USA,* [2]*Tulane University, USA, and* [3]*University of Wisconsin-Madison, USA*

W4P.017 **HIGH-DENSITY NEURAL MICROELECTRODE ARRAYS WITH COMPLEMENTARY WEDGE-SHAPED 3D ASSEMBLY INTERFACES FOR BRAIN ACTIVITY RECORDING**
Liang Geng, Yujie Yang, Dongcheng Xie, Dongliang Chen, Lei Xu, and Feng Wu
University of Science and Technology of China, CHINA

W4P.018 **HIGHLY STABLE PIEZOELECTRIC RESONATOR BASED AIRFLOW SENSOR USING TIME OF FLIGHT TECHNIQUE**
Parvin Akhkandi, Kevin Chan, Yasaman Majd, Hakhamanesh Mansoorzare, and Reza Abdolvand
University of Central Florida, USA

W4P.019 **IN-VITRO MICROFLUIDIC MODEL OF SEPSIS-ASSOCIATED ACUTE KIDNEY INJURY WITH SINGLE CELL IMAGING**
Yuya Araki, Tetsuya Koyama, Hidekuni Takao, Fusao Shimokawa, Daisuke Nakano, and Kyohei Terao
Kagawa University, JAPAN

W4P.020 **MICROFLUIDIC BLOOD PLASMA EXTRACTOR FROM WHOLE BLOOD SAMPLE**
Hogi Hartanto and Ting-Hsuan Chen
City University of Hong Kong, HONG KONG

W4P.021 **MINIATURE TRANSPARENT DOPAMINE SENSOR BASED ON NANOSPHERE LITHOGRAPHY**
Yoojeong Kim, Eunyoung Jang, and Hyunjoo J. Lee
Korea Advanced Institute of Science and Technology (KAIST), KOREA

W4P.022 **SARS-COV-2 INFECTION CAUSED A DAMAGE ON VASCULAR BED CO-CULTURED WITH BRONCHIAL ORGANOIDS IN MICROFLUIDIC DEVICE**
Kazuya Fujimoto, Yuta Nagano, Yoshikazu Kameda, Sayaka Deguchi, Kazuo Takayama, and Ryuji Yokokawa
Kyoto University, JAPAN

W4P.023 **DEVELOPMENT OF NON-CONTACT ELECTRICALLY INDUCUED MICROBUBBLE MICRON DISTANCE SENSOR**
Yibo Ma, Wenjing Huang, Keita Ichikawa, and Yoko Yamanishi
Kyushu University, JAPAN

W4P.024 **SUB-SKIN TEMPERATURE PREDICTION FROM SKIN TEMPERATURE DISTRIBUTION FOR FROSTBITE-FREE CRYO-ANESTHESIA**
Juhee Ko[1], Hyunjoon Son[2], Seongjin Lee[2], Gun-Ho Kim[2], and Jungchul Lee[1]
[1] *Korea Advanced Institute of Science and Technology (KAIST), KOREA and* [2] *Ulsan National Institute of Science and Technology (UNIST), KOREA*

W4P.025 **WIRELESS POWER-UP AND READOUT FROM A LABEL-FREE SENSOR RFID**
Hassan Raji, Pengfei Xie, Seyed Reza Mahmoodi, and Mehdi Javanmard
Rutgers University, USA

MONDAY - Chemical Sensors and Microsystems

M4P.025 **A BREATHEABLE CAPACITIVE HUMIDITY SENSOR BASED ON ELECTROSPUN PVDF/GO COMPOSITES**
Yize Liu, Long Chen, Qian Zhang, and Jianqiu Huang
Southeast University, CHINA

M4P.026 **DISPOSABLE IMPEDANCE SENSOR USING LASER-INDUCED GRAPHENE FOR HYDRAULIC OIL CONTAMINATION MONITORING**
Yuki Okamoto[1], Tomoya Muaramoto[1], Yasuyuki Yamamoto[1], Ryo Matsuura[2], Nobuki Sasaki[2], Yusuke Takei[1], Toshihiro Takeshita[1], Masaaki Ichiki[1], and Takeshi Kobayashi[1]
[1] *National Institute of Advanced Industrial Science and Technology (AIST), JAPAN and* [2] *Yamashin-Filter Corp., JAPAN*

M4P.027 **FLEXIBLE NH3 SENSOR BASED ON POLYANILINE/CARBON NANOTUBES WITH DETECTION LIMIT DOWN TO PPB-LEVEL**
Xue Wang[1], Changhui Zhao[2], Gaoqiang Niu[1], and Fei Wang[1]
[1] *Southern University of Science and Technology, CHINA and* [2] *Anhui University, CHINA*

M4P.27b **LOCALIZATION OF CROP DAMAGES UTILIZING A WAKE-UP GAS SENSOR NETWORK**
Seungbeom Noh[1], Sayali Tope[1], Farhan Sadik Sium[1], Shakir-ul Haque Khan[1], Mohit Karkhanis[1], Leo Wang[1], Adwait Deshpande[1], Rana Dalapati[1], Ravi V. Mural[2], Carlos H. Mastrangelo[1], Mingyu Ji[1], Ling Zang[1], James C. Schnable[2], and Hanseup Kim[1]
[1]*University of Utah, USA and* [2]*University of Nebraska, Lincoln, USA*

M4P.029 **NOVEL 3D PRINTING PAPER-BASED MICROFLUIDIC DEVICES FOR PAPER SPRAY IONIZATIONS (μPAD-MS) AND CHROMATOGRAPHY ANALYSIS OF ILLICIT DRUGS**
Muhammad Faizul Zaki[1], Yi-Xin Wu[2], Pin-Chuan Chen[1], Pai-Shan Chen[2], and Yi-Hsin Liu[3]
[1]*National Taiwan University of Science and Technology, TAIWAN,* [2]*National Taiwan University, TAIWAN, and* [3]*National Taiwan Normal University, TAIWAN*

M4P.030 **SIMPLE AND SMART FLOW INJECTION TYPE WATER QUALITY METER DRIVEN BY BRILLIANT COLORED REAGENT**
Masayuki Kawakami[1,2], Toshihiro Kasama[1], Tomomi Sato[1], Madoka Takai[1], Daisaku Yano[2], Hidekatsu Tazawa[3], Kaito Maehara[4], Hiroshi Murakami[4], and Ryo Miyake[1]
[1]*University of Tokyo, JAPAN,* [2]*Organo Corporation, JAPAN,* [3]*Institute of Microchemical Technology Co., Ltd., JAPAN, and* [4]*Next Computer System Engineering Co., Ltd., JAPAN*

M4P.031 **STATIC AND DYNAMIC MEMS INERTIAL GAS SENSORS**
Matthew Ou[1], Yasser S. Shama[1,2], Bhoomi Mavani[1], Mohamed Arabi[1], Resul Saritas[1], Rana Abdelrahman[1], Sasan Rahmanian[1], Alaaeldin Elhady[1], Raafat Mansour[1], Alexander Penlidis[1], and Eihab M. Abdel-Rahman[1]
[1]*University of Waterloo, CANADA and* [2]*Benha University, EGYPT*

M4P.032 **VISUALIZATION OF FLUID MIXING USING GHZ ULTRASONIC IMAGING**
Anuj Baskota, Justin Kuo, Serhan Ardanuç, and Amit Lal
Geegah Inc, USA

TUESDAY - Chemical Sensors and Microsystems

T4P.026 **A PPT LEVEL PFOS (PERFLUOROOCTANESULFONIC ACID) SENSOR BASED ON AN ECO-FRIENDLY CHITOSAN BIOPOLYMER**
Pawan Pathak, Pouya Borjian, Mohammadreza Chimerad, and Hyoung J. Cho
University of Central Florida, USA

T4P.027 **A SINGLE-CHIP 4-CHANNEL QUADRILATERAL MOX GAS SENSOR WITH DIFFERENT SENSING MATERIALS FOR FOOD DISCRIMINATION**
Ruichen Liu, Ruoyu Zhang, Dongcheng Xie, Chong Xing, Yujie Yang, Muhammad Mustafa, Lei Xu, and Feng Wu
University of Science and Technology of China, CHINA

T4P.028 **COLORIMETRIC READOUT BASED PHOTOIONIZATION DETECTOR FOR GAS CHROMATOGRAPHS**
Jingqin Mao[1], Longze Liu[1], Yahya Atwa[1], Junming Hou[2], and Hamza Shakeel[1]
[1]*Queen's University Belfast, UK and* [2]*Southeast University, CHINA*

T4P.029 **DEVELOPMENT OF A STRIPED GATE POTASSIUM ION SENSOR WITHOUT ANION EXCLUSION MATERIAL FOR LONG-TERM MONITORING**
Md Muztahidul Islam[1], Satoshi Tsuruta[1], Satoshi Ota[1], Satoshi Koike[2], Madoka Takai[3], and Masato Futagawa[1]
[1] *Shizuoka University, JAPAN,* [2] *Vegetalia, Inc., JAPAN, and* [3] *University of Tokyo, JAPAN*

T4P.030 **FREQUENCY RESPONSE OF UNCOATED-MICROCANTILEVERS TO GAS FLOW AT DIFFERENT TEMPERATURES AND ITS APPLICATION IN MOISTURE SENSING**
Hemant K. Verma[1], Faizan T. Beigh[1], Darkasha Khan[1], Manoj Kandpal[2], Satya N. Behra[2], Jaspreet Singh[2], and Akshay Naik[1]
[1] *Indian Institute of Science, Bangalore, INDIA and* [2] *Semi-Conductor Laboratory, INDIA*

T4P.031 **PROPOSAL AND EVALUATION OF DISSOLVED OXYGEN IMAGE SENSOR USING IRIDIUM OXIDE AS SENSING MEMBRANE**
Rena Ueda, Ryosuke Iwatsuchi, Tomoko Horio, Yoshiko Noda, Daisuke Akai, Takeshi Hizawa, Hideo Doi, Yong-Joon Choe, Kazuhiro Takahashi, Toshihiko Noda, and Kazuaki Sawada
Toyohashi University of Technology, JAPAN

T4P.032 **MULTIPLE GAS SPECTROSCOPY USING A GOLD GRATING PLASMONIC PHOTODETECTOR**
Utana Yamaoka[1], Masaaki Oshita[1], Yuuki Kaneda[1], Shiro Saito[2], and Tetsuo Kan[1]
[1] *University of Electro-Communications, JAPAN and* [2] *IMRA JAPAN CO., LTD., JAPAN*

WEDNESDAY - Chemical Sensors and Microsystems

W4P.026 **A CMOS-MEMS BASED MUTIPIXEL GAS SENSOR DESIGN**
Nishit Goel, Ilya Gurin, Stephen F. Bart, and Peter Hartwell
InvenSense Inc., USA

W4P.027 **A STUDY OF GRAPHENE HYSTERESIS EFFECT IN DIFFERENT SOLVENT ENVIRONMENT WITH SUSPENDED/SUPPORTED GRAPHENE DEVICE**
Yu-Xuan Lu, Ming-Hsiu Tsai, and Chih-Ting Lin
National Taiwan University, TAIWAN

W4P.028 **DEVELOPING OF PORTABLE UV-STIMULATED FLOURSECENCE SPECTRUM MEASUREMENT SYSTEM USING SPECTRAL CHIP**
Ciao-Ming Tsai[1], Wei-Yi Kong[2], Wei-Huai Chiu[2], Chitsung Hong[1], Cheng-Hao Ko[2], and Weileun Fang[1]
[1] *National Tsing Hua University, TAIWAN and* [2] *National Taiwan University of Science and Technology, TAIWAN*

W4P.029 **ELECTROCHEMICAL SENSOR WITH 4-MERCAPTOPYRIDINE MODIFICATION FOR TRACE MERCURY DETECTION**
Mingjie Han[1,2], Yong Xie[1,2], Ri Wang[1,2], Yang Li[1], Chao Bian[1], and Shanhong Xia[1]
[1] *Chinese Academy of Sciences (CAS), CHINA and* [2] *University of Chinese Academy of Sciences, CHINA*

W4P.030 **FABRICATION OF AC-DRIVEN VARIABLE GAS PERMEATION CONTROL DEVICES AND VERIFICATION OF CONTROLLABILITY IMPROVEMENT**
Naho Minowa[1], Manase Mizutani[1,2], Yoshihisa Suzuki[2], Yong-Joon Choi[1], Kazuhiro Takahashi[1], Kazuaki Sawada[1], and Toshihiko Noda[1]
[1] *Toyohashi University of Technology, JAPAN and* [2] *Sintokogio, LTD., JAPAN*

W4P.031 **IN SITU INVESTIGATION OF SMALL MOLECULE MASS TRANSPORT IN SENSOR-BASED ORGAN-ON-CHIP SYSTEMS**
Johannes Dornhof, Kevin Ali Beltran Ramirez, Jochen Kieninger, Stefan J. Rupitsch, Gerald A. Urban, and Andreas Weltin
University of Freiburg, GERMANY

W4P.032 **MOF/PDMS HYBRID NANOFILM-BASED QCM FOR VOC SELECTIVE VIRTUAL SENSING IN HIGH-HUMIDITY ENVIRONMENTS**
Mengyao Fu, Dongsheng Li, Chenyang Gao, Jin Xie, Dibo Hou, and Yunqi Cao
Zhejiang University, CHINA

W4P.033 **MULTI-ION SENSOR CHIP FOR HEALTHCARE APPLICATIONS**
Van Anh T. Dam and Marcel A.G. Zevenbergen
Holst Centre / Imec, NETHERLANDS

MONDAY - Composite Materials, Polymers, and Fabrication Processes

M4P.033 **IN-SITU FABRICATION PROCESS OF BACTERIAL CELLULOSE COMPOSITES FOR SOFT ROBOTS**
Motonori Uchimura and Fujio Tsumori
Kyushu University, JAPAN

M4P.034 **MICRO ADHESIVE STRUCTURE BIOINSPIRED BY TREE FROG TOE PAD -FEMTOSECOND LASER FABRICATION ON SPONGE AND FORCE EVALUATION-**
Toshihiro Shiratori, Jinya Sakamoto, Yuki Kumokita, Masato Suzuki, Tomokazu Takahashi, and Seiji Aoyagi
Kansai University, JAPAN

M4P.035 **MICROWAVE CHARACTERIZATION OF PARYLENE C DIELECTRIC AND BARRIER PROPERTIES**
Nikolas D. Barrera[1], Jacob T. Pawlik[2], Eugene J. Yoon[1], James C. Booth[2], Christian J. Long[2], Nathan D. Orloff[2], Ellis Meng[1], and Angela C. Stelson[2]
[1] *University of Southern California, USA and* [2] *National Institute of Standards and Technology, USA*

M4P.036 **NEAR- ZERO POISSON'S RATIO AND LARGE-AREA METAMATERIAL MADE OF UV-PDMS USING 3D BACKSIDE EXPOSURE**
Riku Ito[1], Ten Sekiguch[i1], Vivek Menon[2], Ryo Ichige[1], Yuya Tanaka[1], Hiroshi Toshiyoshi[2], and Takaaki Suzuki[1]
[1] *Gunma University, JAPAN and* [2] *University of Tokyo, JAPAN*

M4P.037 **SPONTANEOUS ADAPTATION OF TOPOGRAPHY IN IMPLANTABLE DEVICES BY KIRIGAMI-INSPIRED SHAPE MEMORY POLYMER BASED MICROELECTRODES**
Yuanhao Xu and Stella W. Pang
City University of Hong Kong, CHINA

TUESDAY - Composite Materials, Polymers, and Fabrication Processes

T4P.034 **3D PRINTED FLUIDIC OSCILLATOR CIRCUITS FOR AUTONOMOUS FLOW DRIVING AND SWITCHING**
Liang-Yen Liu, Cheng-Hao Sun, Cheng-Lun Shih, and Yu-Chuan Su
National Tsing Hua University, TAIWAN

T4P.035 **A NOVEL NORMAL TACTILE FORCE SENSOR USING ANISOTROPIC MAGNETO-RESISTIVE (AMR) SENSING CHIP**
Shihwei Lin, Yuanyuan Huan, Fuchi Shih,
Meifeng Lai, and Weileun Fang
National Tsing Hua University, TAIWAN

T4P.036 **AUTONOMOUS SELF-HEALING, HIGHLY STRETCHABLE, AND ELASTIC CONDUCTIVE COMPOSITES FOR ARTIFICIAL SOFT ELECTRONICS**
Yu-Chia Lin, Kuan-Yu Tu, Lung-Hao Hu, and Ching-Te Kuo
National Sun Yat-sen University, TAIWAN

WEDNESDAY - Composite Materials, Polymers, and Fabrication Processes

W4P.035 **MULTI-MODAL NANOWRINKLES ON TRANSPARENT AND FLEXIBLE FILMS FOR COVERT-OVERT STRUCTURAL COLORATION ACTIVELY MODULATED BY MECHANICAL BENDING**
Sungjoon Ji, Jun Gyu Park, Yeong Hoon Jeong, and Taesung Kim
Ulsan National Institute of Science and Technology (UNIST), KOREA

W4P.037 **POROUS PDMS MICROREACTOR ARRAY CHIP FOR DE NOVO DNA SYNTHESIS**
Xiao Su, Xiaoping Li, Chunjie Sun, Duo Fu, Jiaming Ma,
and Dachao Li
Tianjin University, CHINA

W4P.038 **SYNTHESIS OF TIO_2/MOS_X/AG NANOCOMPOSITES VIA PHOTODEPOSITION FOR ENHANCED PHOTOCATALYSIS AND FOULING RESISTANT MEMBRANE**
Teayeop Kim, Yoonkyung Lee, and Kyunghoon Kim
Sungkyunkwan University, KOREA

MONDAY - Energy, Power and Thermal Management

M4P.038 **3D STACKED MICRO THIN-FILM LITHIUM-ION BATTERIES FOR IMPROVING BOTH SPECIFIC CAPACITY AND CYCLING LIFE**
Xinru Wu[1], Lihao Wang[1], Yonghe Zhuang[2], Hanzi Sun[2], Junfu Liu[2],
Chao Wang[2], Nian Shi[2], and Xiaodong Huang[1]
[1]*Southeast University, CHINA and* [2]*Anhui Province Key Laboratory of Microsystem, CHINA*

M4P.039 **A FLEXIBLE PIEZOELECTRIC ENERGY HARVESTER SIMULTANEOUSLY SCAVENGING MECHANICAL ENERGY OF FISH MOVEMENT AND IMPACT ENERGY OF WATER FLOW**
Tianyu Sheng[1], Yonggang Jiang[1], Qipei He[1],
Wenqiang Zhang[2], and Kensuke Kanda[3]
[1]*Beihang University, CHINA,* [2]*China Agricultural University, CHINA, and* [3]*University of Hyogo, JAPAN*

M4P.040 **CIRCUIT SIMULATOR IMPLEMENTATION OF AN EQUIVALENT CIRCUIT MODEL OF SELF-ASSEMBLED ELECTRET VIBRATIONAL ENERGY HARVESTERS BASED ON AN ENERGY DIAGRAM**
Kyosuke Tokuno[1], Shohei Kinoshita[1], Hideyuki Kayaguchi[2], Keisuke Kurihara[2], Hisao Ishii[2], Yuya Tanaka[3], and Daisuke Yamane[1]
[1]*Ritsumeikan University, JAPAN,* [2]*Chiba University, JAPAN, and* [3]*Gunma University, JAPAN*

M4P.041 **EYE-TEAR-DRIVEN ELECTRET ENERGY HARVESTER FOR SMART CONTACT LENSES**
Adwait Deshpande, Erfan Pourshaban, Mohit U. Karkhanis, Md. Rabiul Hasan, Chayanjit Ghosh, Hanseup Kim, and Carlos H. Mastrangelo
University of Utah, USA

M4P.042 **MEMS-BASED BROAD BAND MICRO VIBRATION ENERGY HARVESTERS UTILIZING $(MgHf)_{0.1}AL_{0.9}N$**
Hung H Nguyen[1,2], Le V. Minh[1], and Hiroki Kuwano[1,2]
[1]*Tohoku University, JAPAN and* [2]*Sendai Smart Machines Co., Ltd., JAPAN*

M4P.043 **METAL-ORGANIC FRAMEWORK AND MOLYBDENUM OXIDE HYBRIDIZED NANOCOMPOSITE-BASED TRIBOELECTRIC BIOMOTION SENSOR FOR WEARABLE SELF-POWERED HUMAN IOT APPLICATIONS**
S M Sohel Rana, Omar Faruk, M. Robiul Islam, HongSeok Kim, Md Abu Zahed, and Jae Y. Park
Kwangwoon University, KOREA

M4P.044 **MONOLITHIC INTEGRATION OF SCALN MEMS FILTER ON RFSOI USING ALD AL2O3 AS VHF BARRIER**
Xinghua Wang, Ying Zhang, Chen Liu, Eugene Yi, Zhun Woo, Wenjia Yang, Nan Wang, Yao Zhu, and Qingxin Zhang
*Agency for Science, Technology and Research (A*STAR), SINGAPORE*

TUESDAY - Energy, Power and Thermal Management

T4P.038 **A HIGHLY SENSITIVE TRIBOELECTRIC QUASI-ZERO STIFFNESS VIBRATION SENSOR WITH WIDE BANDWIDTH**
Pengfan Wu, Fayang Wang, Shiwei Xu, Tao Liu, and Xiaojing Mu
Chongqing University, CHINA

T4P.039 **A LIQUID METAL TRIBOELECTRIC NANOGENERATOR (LM-TENG) USING CF_4/O_2 PLASMA TREATED NONWETTING POLYMER FRICTION LAYER AND GALLIUM ALLOY LIQUID METAL**
Jinwon Jeong and Jeong Bong (JB) Lee
University of Texas, Dallas, USA

T4P.040 **A MEMS VIBRATIONAL ENERGY HARVESTER CAPABLE OF RESTLESS CHARGING CAPACITOR FROM RANDOM VIBRATIONS**
Hiroaki Honma, Yukiya Tohyama, and Hiroshi Toshiyoshi
University of Tokyo, JAPAN

T4P.041 **ELECTROSPINNING OF CANDLE SOOT NANOPARTICLES FOR SUPERCAPACITOR APPLICATION**
Sparsh Gupta[1], Ankur Gupta[2], Dario Mager[3], Jan G. Korvink[3], and Monsur Islam[3]
[1]*Punjab Engineering College, INDIA,* [2]*Indian Institute of Technology Jodhpur, INDIA, and* [3]*Karlsruhe Institute of Technology, GERMANY*

T4P.042 **LIGHT-CONTROLLED PYROELECTRIC EFFECT: DIRECT CONVERSION OF LIGHT-INDUCED HEAT TO PHYSICAL ACTUATION**
Rui M.R. Pinto, Mohammadmahdi Faraji, and K. B. Vinayakumar
INL - International Iberian Nanotechnology Laboratory, PORTUGAL

T4P.043 **ZERO-POWER WIRELESS SENSING SYSTEM BASED ON PIEZOELECTRIC ENERGY HARVESTING TOWARDS BATTERY-FREE IOT APPLICATIONS**
Fangzhi Li, Zhao Chen, Tianyu Zhang, Yongqi Cao, Honglong Chang, Weizheng Yuan, and Kai Tao
Northwestern Polytechnical University, CHINA

WEDNESDAY - Energy, Power and Thermal Management

W4P.040 **HYBRID 3D-PRINTING OF MOLTEN METAL MICRODROPLETS AND POLYMERS FOR PROTOTYPING OF PRINTED CIRCUIT BOARDS WITH INTEGRATED ELECTRICAL ENERGY STORAGE SYSTEMS**
Zeba Khan[1,2], Dheepesh Gururajan[1], Daniel Straubinger[2], Peter Koltay[1], Sabrina Kartmann[1,2], Roland Zengerle[1,2], and Zhe Shu[1,2]
[1]*University of Freiburg, GERMANY and* [2]*Hahn-Schickard, GERMANY*

W4P.041 **NON-RESONANT VIBRATION ENERGY HARVESTER WITH WOUND MICRO-COIL ARRAYS**
Matin Barekatain, Junyi Wang, Akash Roy, Kianoush Sadeghian Esfahani, Jaehoon Lee, and Eun S. Kim
University of Southern California, USA

W4P.042 **OPTIMIZATION OF THE ENERGY HARVESTED BY A TRIBOELECTRIC GENERATOR EXCITED WITH A SMALL NUMBER OF ACTUATIONS**
Ahmad Delbani[1], Naida Hodzic[2], Dimitri Galayko[3], Armine Karami[2], Tarik Bourouina[2], Malal Kane[1], and Philippe Basset[2]
[1]*Université Gustave Eiffel, FRANCE and*
[2]*Sorbonne Université, FRANCE*

W4P.043 **PIEZOELECTRIC ENERGY HARVESTER WITH ANTI-INTERFERENCE ABILITY FOR POWER LINE MONITORING APPLICATION**
Shanghao Gu, Kunling Xi, Anxin Luo, and Fei Wang
Southern University of Science and Technology, CHINA

W4P.044 **STRETCHABLE FLUORINATED ELECTRET FOR SKIN-ATTACHABLE ENERGY HARVESTER**
Rui Wang, Kuniko Suzuki, Masaya Takebe, Yucheng Zhang, Tomoya Miyoshi, and Yuji Suzuki
University of Tokyo, JAPAN

MONDAY - Microfluidics Platform Technologies

M4P.045 **A LABCHIP WITH CO-CULTURED SPHEROIDS APPLIED FOR HIPEC CANCER DRUG SCREENING**
Chang-Hung Hsieh[1], Wei-Yu Huang[1], Mao-Chih Hsieh[2], Yu-ting Tai[2], Jen-Tsan Ashley Chi[3], Si-Jin Dong[1], and Cheng-Hsien Liu[1]
[1]*National Tsing Hua University, TAIWAN,* [2]*Taipei Medical University, TAIWAN, and* [3]*Duke University, USA*

M4P.046 **HIGH-THROUGHPUT GENERATION OF GIANT LIPOSOMES UTILIZING STEP EMULSIFICATION AND PARALLELIZED DROPLET TRANSFER CHANNELS**
Shota Nakagawa, Naotomo Tottori, Sakuma Shinya, and Yoko Yamanishi
Kyushu University, JAPAN

M4P.047 **LIQUID METAL DROPLETS FIBER FABRICATION BY THE CO-FLOW MICROFLUIDIC SYSTEM**
Xu Gao and Wei Wang
Peking University, CHINA

M4P.048 **LIGHT-FIELD MICROSCOPY-BASED COUNTING OF PARTICLES MOVING IN A MICROFLUIDIC VOLUME**
Xinglong Huang[1,2], Xing Cheng[2], and Boris Stoeber[1]
[1]*University of British Columbia, CANADA and* [2]*Southern University of Science and Technology, CHINA*

M4P.049 **NEW EWOD PLATFORM FOR FREELY TRANSPORTING DROPLET IN DOUBLE-PLATES AND SINGLE-PLATE STRUCTURES**
Ting-Rui Huang[1], Yii-Nuoh Chang[1], Yi-Wei Lin[1,2], and Da-Jeng Yao[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*Industrial Technology Research Institute, TAIWAN*

M4P.050 **PROGRAMMABLE ACTIVE FLOW CONTROL SYSTEM FOR MICROFLUIDIC PAPER-BASED ANALYTICAL DEVICES (μPADS) BY SIMPLE SCREW DRIVE**
Chia-Wen Tsao, Po-Heng Lee, Yi-Fang Lai, and Wen-Yih Chen
National Central University, TAIWAN

M4P.051 **TUNABLE ACOUSTIC TWEEZERS FOR DROPLET CARRIER TRANSPORTATION AND PRETREATMENT OF LOADED MICRO-ANALYTES**
Huaize Lan[1], Jingui Qian[1], Hongyu Chen[2], Yong Wang[3], Liang Huang[1], Xuefeng Hu[1], and Wei Zhang[1]
[1]*Hefei University of Technology, CHINA,* [2]*Zhejiang University, CHINA, and* [3]*Hangzhou City University, CHINA*

TUESDAY - Microfluidics Platform Technologies

T4P.044 **3D-PRINTED, INTERNALLY FED MEMS ELECTROSPRAY THRUSTER WITH PRECISE FLOW RATE CONTROL FOR HIGH-IMPULSE CUBESAT MISSIONS**
Hyeonseok Kim and Luis F. Velásquez-García
Massachusetts Institute of Technology, USA

T4P.045 **DUAL-GATE AND OTHER CAPILLARY FIELD EFFECT TRANSISTOR DESIGN IMPROVEMENTS FOR INCREASED SWITCHING SPEED, SEALING EFFICACY, AND LIQUID VISCOSITY RANGE**
Daniel Mak[1], Azadeh Hashemi[1], Claude Meffan[1,2], Julian Menges[1], Henrieke Meijer[3], Fabien Abeille[3], Marko T. Blom[3], Renwick Dobson[1], and Volker Nock[1]
[1] *University of Canterbury, NEW ZEALAND,* [2] *Kyoto University, JAPAN, and* [3] *Micronit B.V., NETHERLANDS*

T4P.046 **FRACTION COLLECTORS FOR CONDUCTING CHROMATOGRAPHY ON A CENTRIFUGAL PLATFORM**
Yi-Hui Chen, Yuan-Ting Cheng, and Chih-Hsin Shih
Feng Chia University, TAIWAN

T4P.047 **LATE-STAGE ZEBRAFISH EMBRYO MANIPULATION AND IMAGING WITH ACOUSTIC TWEEZERS BASED ON BESSEL BEAM TRAPPING**
Baptiste Neff, Kianoush Sadeghian Esfahani, Matin Barekatain, Akash Roy, Jaehoon Lee, and Eun S. Kim
University of Southern California, USA

T4P.048 **LOW-COST AND RAPID FABRICATION OF MICROCHANNELS BY KIRIGAMI-BASED SOOT COATING FOR THE DETECTION OF EXPLOSIVES**
Wei Yue[1], Hanxiao Liu[1,2], Xinyu Zhou[3], Chun-ming Chen[4], Yande Peng[1], Fanping Sui[1], Ying Dong[2], and Liwei Lin[1]
[1] *University of California, Berkeley, USA,* [2] *Tsinghua University, CHINA,* [3] *Peking University, CHINA, and* [4] *National Tsinghua University, TAIWAN*

T4P.049 **ULTRA-FAST ACOUSTOFLUIDIC PARTICLE FOCUSING USING LATERAL MODES OF A PLATE TRANSDUCER**
Andreas Fuchsluger[1], Annalisa De-Pastina[2], Tina Mitteramskogler[1], Rafael Ecker[1], Thomas Voglhuber-Brunnmaier[1], Nikolai Andrianov[2], Alexander Shatalov[2], Norbert Cselyuszka[2], Mohssen Moridi[2], and Bernhard Jakoby[1]
[1] *Johannes Kepler Universität Linz, AUSTRIA and* [2] *Silicon Austria Labs, AUSTRIA*

WEDNESDAY - Microfluidics Platform Technologies

W4P.045 **3D-PRINTED POROUS MICRONEEDLES FOR WOUND HEALING**
Esraa A. Fakeih, Andrés A. Aguirre-Pablo, Dana Z. Al Sulaiman, Sigurdur T. Thoroddsen, and Khaled N. Salama
King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA

W4P.046 **A FACILE APPROACH FOR FABRICATING ORDERED SUBMICROMETER-WIDE SURFACE PATTERNS BY IMPRINTING POLYDIMETHYLSILOXANE CRACKS**
Yang Bu, Sheng Ni, and Levent Yobas
Hong Kong University of Science and Technology, HONG KONG

W4P.047 **COCKTAIL DRUGS DELIVERY CHIP WITH SELECTIVELY CROSSLINKING HYDROGEL FOR COLON CANCER DRUG SCREENING**
HsinYu Yang[1,2] and FanGang Tseng[1,2]
[1] *National Tsing Hua University, TAIWAN and* [2] *Acdamia Sinica, TAIWAN*

W4P.048 **FABRICATION AND EVALUATION OF HIERARCHICAL SUPERHYDROPHOBIC AND SALVINIA SURFACES**
Zhaohui R. Li, Xiaojie Tao, and Chang-Jin "CJ" Kim
University of California, Los Angeles, USA

W4P.049 **MICROFLUIDIC THORMBUS ANALYSIS SYSTEM**
Ji-Seob Choi[1], Dong-Hwi Ham[1], Jin-Ho Choi[2], and Woo-Tae Park[1]
[1]*Seoul National University of Science and Technology, KOREA and* [2]*Samsung Medical Center, KOREA*

MONDAY - Nanoscale Materials and Fabrication

M4P.052 **ELECTRETIZATION OF NANO-THICK AL_2O_3 FILMS DURING ATOMIC LAYER DEPOSITION**
Yoshito Iguchi, Momoko Narasaki, Akio Uesugi,
Koji Sugano, and Yoshitada Isono
Kobe University, JAPAN

M4P.053 **FABRICATION METHOD OF VERSATILE MICRO/NANO HIERARCHICAL STRUCTURE AND ITS USAGE AS SUPERHYDROPHOBIC FLEXIBLE FILM**
Yongrok Jeong[1], Junseong Ahn[1], Byeongmin Kang[2],
Ji-Hwan Ha[1,2], Jiwoo Ko[1], Soon Hyoung Hwang[2],
Sohee Jeon[2], Jun-Ho Jeong[2], and Inkyu Park[1]
[1]*Korea Advanced Institute of Science and Technology (KAIST), KOREA and* [2]*Korea Institute of Machinery and Materials, KOREA*

M4P.054 **RESIDUE-FREE TRANSFER OF VERTICALLY ALIGNED CARBON NANOTUBE ARRAYS USING THIN ICE FILM**
Hyunjun Han, Kyuhyun Hwang, Eunhwan Jo,
Daeyeon Koh, and Jongbaeg Kim
Yonsei University, KOREA

M4P.055 **TWO-DIMENSIONAL MOS_2-BASED FLEXIBLE SENSOR FOR SENSITIVE, REAL-TIME MONITORING OF LITHIUM-ION BATTERY TEMPERATURE**
Dianhong Huo and Jungwook Choi
Chung-Ang University, KOREA

TUESDAY - Nanoscale Materials and Fabrication

T4P.050 **FLOW BEHAVIOR CHARACTERIZATION OF DNA MOLECULES IN PASSIVE NANOFLUIDIC DEVICES**
Franziska M. Esmek[1], Phil Grzybeck[1], Rukan Nasri[1,2],
Dennis H.B. Mors[1], Sadhana Tiwari[1],
and Irene Fernandez-Cuesta[1,2]
[1]*Universität Hamburg, GERMANY and* [2]*Hamburg Centre for Ultrafast Imaging, GERMANY*

T4P.051 **FORMATION DYNAMICS OF DNA CONDENSATES IN MONODISPERSE GUVS TOWARD CONSTRUCTION OF ARTIFICIAL CELLS WITH NUCLEUS**
Ryotaro Yoneyama[1], Ryota Ushiyama[1], Tomoya Maruyama[2],
Masahiro Takinoue[2], and Hiroaki Suzuki[1]
[1]*Chuo University, JAPAN and* [2]*Tokyo Institute of Technology, JAPAN*

T4P.052 **INDIVIDUALLY ADDRESSABLE, 3D-PRINTED CARBON NANOTUBE FIELD EMITTER ARRAYS FOR LARGE-AREA VACUUM ELECTRONICS**
Crystal E. Owens, Alex Kachkine, Gareth H. McKinley, Luis F. Velásquez-Garcia, and A. John Hart
Massachusetts Institute of Technology, USA

T4P.053 **NANO-WIDTH ZIGZAG FLEXURE STRUCTURES FOR HIGHLY TUNABLE GRATING PITCH**
Kiryu Atsuya, Gaku Furusawa, Oshita Masaaki, and Tetsuo Kan
University of Electro-Communications, JAPAN

T4P.054 **NANOSCALE STENCILS FABRICATED BY FOCUSED ION BEAM MILLING AND DRY TRANSFER OF SILICON-ON-NOTHING MEMBRANES**
Taeyeong Kim and Jungchul Lee
Korea Advanced Institute of Science and Technology (KAIST), KOREA

WEDNESDAY - Nanoscale Materials and Fabrication

W4P.050 **CONTROLLABLY CONSTRUCTING GOLD NANOSTRUCTURES ON ELECTRODES THROUGH GROWTH OF ZINC OXIDE NANORODS AND TWO-STEP ELECTROPLATING**
Shengsen Zhang, Shengjie Chen, Kunru Yu, and Rong Zhu
Tsinghua University, CHINA

W4P.051 **DNA CROSS-LINKED MODULAR STIMULI-RESPONSIVE GEL SENSOR UTILIZING NUCLEIC ACID REACTION FOR MICROFLUIDIC SYSTEMS**
Satofumi Kato[1], Yurika Ishiba[1], Masahiro Takinoue[2], and Hiroaki Onoe[1]
[1] *Keio University, JAPAN and* [2] *Tokyo Institute of Technology, JAPAN*

W4P.052 **INVESTIGATION OF ELASTIC SOFTENING AND STIFFENING EFFECT OF ALUMINUM NITRIDE UNDER STRESS LOADING BY BORN-LANDE EQUATION**
Cong Chen[1], Yuwen Lu[1], Jie Zhang[1], Libing Bai[1], Jiahao Wang[1], Yuhua Cheng[1], and Hong Zhou[2]
[1] *University of Electronic Science and Technology of China, CHINA and* [2] *National University of Singapore, SINGAPORE*

W4P.053 **NANOGAP CONTROL OF GOLD NANOPARTICLE DIMER TOWARD ELECTRICAL AND OPTICAL SINGLE MOLECULE MEASUREMENTS**
Yuanzhi Chang, Takayuki Sumitomo, Akio Uesugi, Koji Sugano, and Yoshitada Isono
Kobe University, JAPAN

W4P.054 **NEMS PRESSURE GAUGE BASED ON 2D $Ti_3C_2T_x$ RESONATORS**
Bo Xu, Jiankai Zhu, Fei Xiao, Na Liu, Hujie Wan, Xu Xiao, Juan Xia, and Zenghui Wang
University of Electronic Science and Technology of China, CHINA

W4P.055 **VISUALIZATION OF GAS SPATIOTEMPORAL DISTRIBUTION USING 2D LSPR GAS SENSOR**
Masato Matsuoka, Ge Lingpu, Fumihiro Sassa, and Kenshi Hayashi
Kyushu University, JAPAN

MONDAY - Optical and Atomic Transducers

M4P.056 **A NOVEL WATER-IMMERSIBLE METAL MICRO SCANNING MIRROR BASED ON ZIGZAG BEAM STRUCTURE**
Er-Qi Tu, Xin-Lu Deng, Xiao-Yong Fang, Sen-Yuan Yu, Xiang-Hao Kong, Jia-Zhe Liang, and Wen-Ming Zhang
Shanghai Jiao Tong University (SJTU), CHINA

M4P.057 **A RESONANT PIEZOELECTRIC MEMS MIRROR WITH 180-DEGREE OPTICAL SCAN ANGLE UNDER ATMOSPHERE PRESSURE**
Hung-Yu Lin[1], Hao-Chien Cheng[1,2], Shih-Chi Liu[1], Chih-Chen Hsu[1], Si-Han Chen[1], Jerwei Hsieh[3], Ruey-Shing Huang[3,4], Mei-Feng Lai[1], and Weileun Fang[1]
[1]*National Tsing Hua University, TAIWAN,* [2]*Coretronic MEMS Corporation, TAIWAN,* [3]*Asia Pacific Microsystems, Inc., TAIWAN, and* [4]*National Sun Yat-sen University, TAIWAN*

M4P.058 **ABSOLUTE PRESSURE MEASUREMENT OF SUB-MILLIPASCAL ORDER USING LASER RADIATION FORCE**
Yuki Takei, Yuki Okamoto, Masaaki Ichiki, and Hiromitsu Furukawa
National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

M4P.059 **COMBINING PIEZORESISTIVE AND PIEZOELECTRIC SENSING IN PZT-DRIVEN RESONANT MEMS MICROMIRRORS FOR OPTIMAL STABILITY**
Paolo Frigerio[1], Andrea Bertazzoni1, Roberto Carminati[2], Luca Molinari[2], Gianluca Mendicino[2], and Giacomo Langfelder[2]
[1]*Politecnico di Milano, ITALY and* [2]*STMicroelectronics, ITALY*

M4P.060 **MEMS TE0-TEN MODE SELECTIVE SWITCH FOR MODE DIVISION MULTIPLEXING SYSTEMS**
Haoyang Sun[1], Qifeng Qiao[1,2], and Guangya Zhou[1]
[1]*National University of Singapore, SINGAPORE and* [2]*Shanghai Industrial μTechnology Research Institute, CHINA*

M4P.061 **MICROAPERTURE MODULATED ULTRATHIN ARRAY CAMERA FOR HIGH DYNAMIC RANGE (HDR) IMAGING**
Young-Gil Cha, Hyun-Kyung Kim, Jae-Myeong Kwon, and Ki-Hun Jeong
Korea Advanced Institute of Science and Technology (KAIST), KOREA

TUESDAY - Optical and Atomic Transducers

T4P.055 **A 2-AXIS SCANNING COMB-DRIVE MICROMIRROR WITH POLYMER-FILLED ISOLATION TRENCHES**
Yingchao Cao, Yingtao Ding, Yangyang Yan, and Huikai Xie
Beijing Institute of Technology, CHINA

T4P.056 **A LIGHTWEIGHT MICROMIRROR MADE OF ATOMIC-LAYER-DEPOSITION ALUMINA AND SILICON WITH A HIGH ASPECT-RATIO STIFFENING STRUCTURE**
Nguyen Thanh Tung[1], Takashi Sasaki[1], Daniel Greif[2], Katie Smyth[2], Sergey Lamansky[2], and Kazuhiro Hane[1]
[1]*Tohoku University, JAPAN and* [2]*Meta, USA*

T4P.057 **CURRENT SENSING BASED ON MICROFABRICATED DIAMOND QUANTUM MAGNETOMETER**
Qihui Liu[1,2], Hao Chen[1,2], Fei Xie[1,2], Yuqiang Hu[3,4], Nan Wang[1,2], Lihao Wang[1], Yichen Liu[1], Yang Wang[1], Zhichao Chen[1,2], Lingyun Li[1,2], Jiangong Cheng[1,2], and Zhenyu Wu[1,2]
[1] *Chinese Academy of Sciences (CAS), CHINA,* [2] *University of Chinese Academy of Sciences, CHINA,* [3] *Shanghai University, CHINA, and* [4] *Shanghai Industrial μTechnology Research Institute, CHINA*

T4P.058 **LARGE STROKE PIEZO MEMS MIRROR FOR HIGH-SPEED FOURIER TRANSFORM SPECTROSCOPY**
Jaka Pribošek, Anton Lagosh, and Gerald Auböck
Silicon Austria Labs GmbH (SAL), AUSTRIA

T4P.059 **MONOLITHIC CMOS-COMPATIBLE CO2 SENSOR WITH THERMAL SOURCE AND DETECTOR**
Cristina Consani[1], Nathanael Barlier[1], Gerald Stocker[2], Florian Dubois[1], Thang Duy Dao[1], Khaoula-Farah Ourak[1], Pooja Thakkar[1], Ulf Bartl[2], Christoph Kovatsch[2], Thomas Ostermann[2], Andreas Tortschanoff[1], Thomas Grille[2], and Clement Fleury[1]
[1] *Silicon Austria Labs GmbH (SAL), AUSTRIA and* [2] *Infineon Technologies Austria AG, AUSTRIA*

T4P.060 **OVER-COUPLED MODE BASED ON METAMATERIAL ABSORBER FOR ENHANCED MOLECULAR DETECTION**
Dongxiao Li, Hong Zhou, Zhihao Ren, and Chengkuo Lee
National University of Singapore, SINGAPORE

WEDNESDAY - Optical and Atomic Transducers

W4P.056 **A MEMS RECONFIGURABLE TERAHERTZ METAMATERIAL ABSORBER BASED ON THE TUNABLE AIR GAP**
Zhenci Sun[1], Chen Chen[1], Xiaomeng Bian[2], Yuanmu Yang[1], Rui You[2], Xiaoguang Zhao[1], and Jiahao Zhao[1]
[1] *Tsinghua University, CHINA and* [2] *Beijing Information Science and Technology University, CHINA*

W4P.057 **CHIP-SCALE DIGITAL MID-INFRARED COMPUTATIONAL SPECTROMETER POWERED BY MEMS TECHNOLOGY**
Haoyang Sun[1], Qifeng Qiao[1,2], and Guangya Zhou1
[1] *National University of Singapore, SINGAPORE and* [2] *Shanghai Industrial μTechnology Research Institute, CHINA*

W4P.058 **INTEGRATION OF (POLY-SILICON/AIR)^N DISTRIBUTED BRAGG REFLECTORS IN A 150 MM BULK MICROMACHINED WAFER-LEVEL MOEMS FABRICATION PROCESS FOR THE USAGE IN IR-SPECTROMETRY**
Christian Helke[1,2], Jan Seiler[1,2], Marco Meinig[1], Toni Großmann[1,2], Thomas Werner[1], Jens Bonitz[1], Micha Haase[1,2], Sven Zimmermann[1,2], Martin Ebermann[3], Steffen Kurth[1], Danny Reuter[1,2], and Karla Hiller[1,2]
[1] *Fraunhofer ENAS, GERMANY,* [2] *Technische Universität Chemnitz, GERMANY, and* [3] *InfraTec GmbH, GERMANY*

W4P.059 **NOVEL TERRACED CAVITIES DESIGN ON IR-ABSORBER SURFACE FOR CMOS-MEMS THERMOELECTRIC INFRARED SENSOR**
Yung-Chen Li, Yuanyuan Huang, You-An Lin, Da-Jen Yen, Mei-Feng Lai, and Weileun Fang
National Tsing Hua University, TAIWAN

W4P.060 **PIEZO-ACTUATED HIGHER ORDER WAVEFRONT CORRECTION LENS**
Hitesh G.B. Gowda[1], Matthias C. Wapler[1,2], and Ulrike Wallrabe[1]
[1] *University of Freiburg, GERMANY and* [2] *Otto von Guericke University Magdeburg, GERMANY*

W4P.061 **WIDE ANGLE AND HIGH FREQUENCY RESONANT PIEZOELECTRIC MEMS MIRROR FOR LASER BEAM SCANNING APPLICATION**
Hung-Yu Lin[1], Hao-Chien Cheng[1,2], Shi-Chi Liu[1], Chih-Chen Hsu[1], Si-Han Chen[1], Mingching Wu[2], Kai-Chih Liang[2], Mei-Feng Lai[1], and Weileun Fang[1]
[1] *National Tsing Hua University, TAIWAN and*
[2] *Coretronic MEMS Corporation, TAIWAN*

MONDAY - Packaging & Solid-State Materials and Fabrication Processes

M4P.062 **CROSS-SECTIONAL SHAPE CONTROL OF MICROCHANNEL ON MICROPOWDER BLASTING WITH NOZZLE TILTING ANGLE**
Hiromasa Yagyu, Mikinari Takada, and Mao Hamamoto
Kanto Gakuin University, JAPAN

M4P.063 **FABRICATION OF HIGH-DENSITY MICRO-BUMP ARRAYS FOR 3D INTEGRATION OF MEMS AND CMOS**
Yunfan Shi[1], Zilin Wang[1], Rutian Huang[1], Jin Kang[2], Kai Zheng[2], Weihai Bu[2], and Zheyao Wang[1,3]
[1] *Tsinghua University, CHINA,* [2] *Semiconductor Technology Innovation Center Corporation, CHINA, and* [3] *Beijing Innovation Center for Future Chips, CHINA*

M4P.064 **FABRICATION OF ULTRA-LOW RESONANCE FREQUENCY INERTIAL MEMS USING THROUGH-SILICON DEEP-RIE APPLIED TO SILICON-ON-GLASS**
Jun Wu, Hui Zhang, and Tamio Ikehashi
Waseda University, JAPAN

M4P.065 **ON-CHIP LASER BEAM DELIVERY FOR INTEGRATED ION TRAPS**
Mario Grüneberg[1], Jaka Pribošek[1], Andreu Llobera[1], Alexander Zesar[2], Jakob Wahl[2], Matthias Preidl[2], Yves Colombe[2], Klemens Schüppert[2], Clemens Rössler[2], Philipp Hurdax[3], Bernhard Lamprecht[3], and Matteo Montagnese[1]
[1] *Silicon Austria Labs GmbH (SAL), AUSTRIA,* [2] *Infineon Technologies, AUSTRIA, and* [3] *Joanneum Research Forschungsgesellschaft GmbH, AUSTRIA*

M4P.066 **ULTRASONIC TEST STRUCTURES FOR NON-DESTRUCTIVE MEASUREMENT OF TRAPEZOIDAL ANGLE IN BOSCH PROCESSES**
Lucrezia Maini[1], Roman Furrer[2], Vicente Genovés[1], and Cosmin Roman[1]
[1] *ETH Zürich, SWITZERLAND and* [2] *EMPA Dübendorf, SWITZERLAND*

M4P.067 **ULTRATHICK LOW-STRESS POLY-SILICON FILM FOR MEMS PREPARED BY LPCVD PROCESS**
Gen Shikida[1], Hideharu Itatani[1], Toshio Kudo[1], Shuntaro Machida[1], Yukio Suzuki[2], Shuji Tanaka[2], and Manabu Izumi[1]
[1] *Kokusai Electric Corporation, JAPAN and* [2] *Tohoku University, JAPAN*

TUESDAY - Packaging & Solid-State Materials and Fabrication Processes

T4P.061 **200MM WAFER RECONSTITUTION FOR SENSOR APPLICATION**
Wei Wei[1], Yunlong Li[2], Gauri Karve[1], Lei Zhang[1], Tim Stakenborg[1], and Deniz S. Tezcan[1]
[1] *IMEC, BELGIUM and* [2] *Zhejiang University, CHINA*

T4P.062 **A NOVEL ANISOTROPIC WET ETCHING PROCESS OF (100)-SILICON WITH AREA EFFICIENCY ON CONVEX CORNER COMPENSATION PATTERNS**
Shaoxiao Nie, Xu Ma, Fanrui Meng, Cong Zhou, Jie Wang, Yunfei Liu, Wenhua Xu, Zhenchuan Yang, Yilong Hao, and Chengchen Gao
Peking University, CHINA

T4P.063 **DESIGN AND FABRICATION OF A SMART VAPORASING LIQUID MICROTHRUSTER FOR CUBESAT APPLICATIONS**
Georgios Spernovasilis, Henk W. van Zeijl, and Pasqualina M. Sarro
Delft University of Technology, NETHERLANDS

T4P.064 **GAS PERMEABLE ENVIRONMENTAL PROTECTION CAPS FOR WAFER LEVEL CAPPING OF MEMS GAS AND PRESSURE SENSORS**
Ole Behrmann[1], Thomas Lisec[1], Stefan Schröder[2], and Björn Gojdka[1]
[1] *Fraunhofer Institute for Silicon Technology ISIT, GERMANY and* [2] *Kiel University, GERMANY*

T4P.065 **LARGE-SCALE AND HIGH-ASPECT-RATIO MICRO/NANO GLASS STRUCTURES VIA A REFLOW PROCESS**
Minjie Zhu, Xiaohui Du, Shuai Liu, and Fanhong Chen
Instrumentation Technology and Economy Institute, CHINA

T4P.066 **SINGLE-CRYSTALLINE-SILICON TSV BASED ON DRY FILLING AND OXIDATION OF SUBMICRON SILICON PARTICLES**
Biyun Ling[1], Biqing Zhou[1,2], Xiaoyue Wang[1], Yaming Wu[1], and Gang Quan[1]
[1] *Chinese Academy of Sciences (CAS), CHINA and* [2] *University of Chinese Academy of Sciences, CHINA*

WEDNESDAY - Packaging & Solid-State Materials and Fabrication Processes

W4P.062 **DESIGN AND FABRICATION OF A PASSIVE PRESSURE SENSOR BASED ON BIOCOMPATIBLE ORMOCOMP**
Yi Chiu[1], Chun-Hsiang Liao[1], Gianmario Scotti[1], Parvaneh Sardarabadi[2], and Cheng-Hsien Liu[2]
[1] *National Yang Ming Chiao Tung University, TAIWAN and* [2] *National Tsing Hua University, TAIWAN*

W4P.063 **PLASMA-BASED ADDITIVE MANUFACTURING METHOD FOR MEMS USING APSLD (ATMOSPHERIC PRESSURE SPUTTERING LAYER DEPOSITION) TECHNOLOGY**
Jan Bickel[1], Roland Gesche[2], Martin Fieber[2], Joachim Scherer[3], Reinhold Kovacs[3], Xiaodong Hu[4], and Ha Duong Ngo[1]
[1] *University of Applied Sciences Berlin, GERMANY,* [2] *BEAPLAS GmbH, GERMANY,* [3] *Aurion Anlagentechnik GmbH, GERMANY, and* [4] *MSG Lithoglas GmbH, GERMANY*

W4P.064 **SINGLE PASCAL VACUUM SEALING OF MEMS RESONATOR BY SILICON MIGRATION WAFER-LEVEL PACKAGING WITIOUT GETTER**

Yukio Suzuki[1], Muhammad Jehanzeb Khan[1], Munehiro Honda[2], Hidetoshi Miyashita[2], Tianjiao Gong[1], Takashiro Tsukamoto[1], and Shuji Tanaka[1]
[1] *Tohoku University, JAPAN and* [2] *Sony Semiconductor Manufacturing Corporation, JAPAN*

W4P.065 **ULTRAFAST DIRECT WRITING OF POLYMERS AS A SIMPLE FABRICATION METHOD FOR ORGANIC ELECTROCHEMICAL TRANSISTORS**

Alessandro Enrico[1], Sebastian Buchmann[1,2], Fabio De Ferrari[1], Yazhou Wang[3], Wan Yue[4], Göran Stemme[1], Frank Niklaus[1], Anna Herland[1,2], and Erica Zeglio[1,2]
[1] *KTH Royal Institute of Technology, SWEDEN,* [2] *Karolinska Institute, SWEDEN,* [3] *King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA, and* [4] *Sun Yat-sen University, CHINA*

MONDAY - Physical Sensors and Microsystems

M4P.068 **A CMOS-MEMS THREE-AXIS MAGNETIC SENSOR WITH A FERROMAGNETIC CONCENTRATOR**

Yun-Wen Lai, Yu-Lin Yang, and Shih-Jui Chen
National Central University, TAIWAN

M4P.069 **A FAST CHARACTERIZATION METHOD FOR PRESSURE SENSORS WITH CONTINUOUSLY RAMPING PRESSURE AND TEMPERATURE**

Chen Wang[1], Appo van der Wie[2], Grim Keulemans[1], Ben Maes[2], Maliheh Ramezani[2], and Michael Kraft[1]
[1] *University of Leuven, BELGIUM and* [2] *Melexis, BELGIUM*

M4P.070 **A MINIATURIZED LEAF CUVETTE FOR VOLATILE ORGANIC COMPOUND MEASUREMENT ON BROAD LEAVES**

Yasmina Frey, Simon Haberstroh, Mirjam Meischner, Christiane Werner, and Ulrike Wallrabe
University of Freiburg, GERMANY

M4P.071 **A RESONANT-BASED HIGHLY SENSITIVE GAS SENSOR WITH A FUNCTIONAL COMPOSITE MEMBRANE**

Na Ling, Wei Zhang, Jiajia Xiang, Jiayang Chen, Lijia Zhang, Cao Xia, Yuanlin Xia, and Zhuqing Wang
Sichuan University, CHINA

M4P.072 **A RESONANT PRESSURE SENSOR WITH SUPER HIGH RESOLUTION AND STABILITY BASED ON NOVEL VOLUME SHRINKAGE METHOD**

Toshiki Mitsuhashi[1], Ken Kanno[2], Shigeto Iwai[1], Atsushi Yumoto[1], Daisuke Hatori[1], and Ryuuichirou Noda[1]
[1] *Yokogawa Electric Corporation, JAPAN and*
[2] *PT Yokogawa Indonesia, INDONESIA*

M4P.073 **A THREE-AXIS CO-OSCILLATING VECTOR HYDROPHONE BASED ON MEMS ELECTROCHEMISTRY**

Lintao Hu[1,2], Tian Liang[1,2], Zhenyu Sun[1,2], Maoqi Zhu[1,2], Mingbo Zhang[1,2], Junbo Wang[1,2], Deyong Chen[1,2], and Jian Chen[1,2]
[1] *Chinese Academy of Sciences (CAS), CHINA and*
[2] *University of Chinese Academy of Sciences, CHINA*

M4P.074 **AN ALL-SILICON RESONANT DIFFERENTIAL PRESSURE MICROSENSOR WITH TEMPERATURE COMPENSATION**
Jiahui Yao[1,2], Chao Cheng[1,2], Han Xue[1,2], Zongze Yu[1,2], Yulan Lu[1], Bo Xie[1], Junbo Wang[1,2], Deyong Chen[1,2], and Jian Chen[2]
[1] *Chinese Academy of Sciences (CAS), CHINA and*
[2] *University of Chinese Academy of Sciences, CHINA*

M4P.075 **DEVELOPMENT OF FLEXIBLE PIEZOELECTRIC HAIR-LIKE DUAL-MODE SENSOR FOR DETECTION OF AIRFLOW AND ACOUSTIC PARTICLE VELOCITY**
Biao Jin, Hongchao Cao, Tianyu Sheng, Qipei He, Yansong Gai, and Yonggang Jiang
Beihang University, CHINA

M4P.076 **DOUBLE-PROOF MASS SOI-BASED MATRYOSHKA-LIKE 3-AXIS MEMS ACCELEROMETER**
Inês S. Garcia[1], José Fernandes[1], José B. Queiroz[1], Carlos Calaza[1], José Moreira[2], Rosana A. Dias[1], and Filipe S. Alves[1]
[1] *International Iberian Nanotechnology Laboratory (INL), PORTUGAL and* [2] *Redes Energéticas Nacionais (REN), PORTUGAL*

M4P.077 **FIRST DEMONSTRATION OF A PRINTABLE FUSED-SILICA GLASS BASED MILLI-METER SIZED RESONATOR**
Yahya Atwa and Hamza Shakeel
Queen's University Belfast, UK

M4P.078 **IMPROVED REPRODUCIBILITY OF DEFLECTION CONTROL PROCESS FOR CANTILEVER-TYPE MEMS TACTILE SENSORS**
Harufumi Hosokawa, Yuki Kawasaki, Yingquan Zheng, Takashi Abe, and Masayuki Sohgawa
Niigata University, JAPAN

M4P.079 **NEST BOX FOR MONITORING THE MASS AND HEART RATE CHANGES OF A GROWING SEABIRD CHICK**
Daiki Uematsu[1], Takuto Kishimoto[1], Kazuki Harada[2], Shinichi Watanabe[3], Katsufumi Sato[2], and Hidetoshi Takahashi[1]
[1] *Keio University, JAPAN,* [2] *University of Tokyo, JAPAN, and* [3] *Research Institute of Rare Birds Japan, JAPAN*

M4P.080 **OPTICALLY PUMPED SOLID STATE QUANTUM MAGNETOMETERS FOR SPACE APPLICATIONS**
Andreas Gottscholl, Hannes Kraus, and Corey J. Cochrane
California Institute of Technology, USA

M4P.081 **PARAMETER OPTIMIZATION FOR AMPLITUDE-MODULATED RESONANT MEMS SENSORS FEATURING BLUE SIDEBAND EXCITATION**
Jingqian Xi[1], Lei Xu[1], Xingyin Xiong[4], Xudong Zou[4], Chengxin Li[5], Fangjing Hu[1], Yuan Wang[2], Huafeng Liu[1], and Chun Zhao[3]
[1] *Huazhong University of Science and Technology, CHINA,*
[2] *University of Macau, CHINA,* [3] *University of York, UK,*
[4] *Chinese Academy of Sciences (CAS), CHINA, and*
[5] *University of Leuven, BELGIUM*

M4P.082 **PRESSURE SENSOR WITH A CORRUGATED STRUCTURE UTILIZING LIG SENSING ELEMENT**
Ryo Oda, Rihachiro Nakashima, and Hidetoshi Takahashi
Keio University, JAPAN

M4P.083 **SLIP DETECTION USING A HEAT-FLOW-TYPE WARMTH SENSOR**
Hiro Kanamori and Yoshiyuki Hata
Meijo university, JAPAN

M4P.084 **TEMPERATURE BEHAVIOUR OF RAYLEIGH, SEZAWA AND LAMB MODE RESONANCE FREQUENCIES OF 30% SCALN/SI SAW DEVICES**
Alexandra Nicoloiu[1], George Boldeiu[1], Claudia Nastase[1], Monica Nedelcu[1], Cristina Ciornei[1], Ioana Zdru[1], George Stavrinidis[2], Dan Vasilache[1], Antonis Stavrinidis[2], Adrian Dinescu[1], George Konstantinidis[2], and Alexandru Müller[1]
[1]*IMT Bucharest, ROMANIA and* [2]*FORTH IESL Heraklion, GREECE*

M4P.085 **TEXTILE-BASED STRETCHABLE STRAIN SENSOR FOR HUMAN ACTIVITY AND HEALTH MONITORING**
Rui M.R. Pinto, Mohammadmahdi Faraji, and K.B. Vinayakumar
INL - International Iberian Nanotechnology Laboratory, PORTUGAL

M4P.086 **UNIVERSAL CONCEPT FOR FABRICATING LOW RESIDUAL STRESS PZT FILM-BASED PMUT ON SILICON WAFER USING BOTTOM-UP METHOD**
Yuh-Cherng Lai and Guo-Hua Feng
National Tsing Hua University, TAIWAN

M4P.087 **UNIVERSAL OPTIMIZATION SOLUTION FOR DIELECTRIC GEOMETRY ON SENSITIVITY MAXIMIZATION IN FLEXIBLE CAPACITIVE TACTILE SENSORS**
Tzu-Yi Hsu[1], Chieh-Cheng Wang[1], Padmanabh P. Pancham[1], Wen-Hsin Chiu[1], Daisuke Yamane[2], and Cheng-Yao Lo[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*Ritsumeikan University, JAPAN*

TUESDAY - Physical Sensors and Microsystems

T4P.067 **4.51 MILLION QUALITY FACTOR IN MICRO HEMISPHERICAL RESONATOR FABRICATED FROM LASER ABLATION AND WELDING**
Weiyu Zhu, Yan shi, Xiang Xi, Kun Lu, Zhanqiang Hou, Dingbang Xiao and Xuezhong Wu
National University of Defense Technology, CHINA

T4P.068 **A BIODEGRADABLE STACKED-INDUCTORS LC SENSOR FOR INTERNAL BODY TEMPERATURE MONITORING**
Li-Feng Wang, Jing-Jing Lu, Lei Dong, Qing-An Huang, and ZhenXiang Yi
Southeast University, CHINA

T4P.069 **A MEMS RESONANT PRESSURE SENSOR BASED ON CAVITY-SOI**
Han Xue[1,2], Jiahui Yao[1,2], Chao Cheng[1,2], Zongze Yu[1,2], Yulan Lu[1], Bo Xie[1,2], Junbo Wang[1,2], Deyong Chen[1,2], and Jian Chen[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

T4P.070 **A SELF-ADAPTIVE PHASE DIFFERENCE MEASUREMENT SYSTEM FOR MEMS RESONANT ACCELEROMETER**
Liangbo Ma[1,2], Xingyin Xiong[1], Zheng Wang[1], Kunfeng Wang[1,2], Zhaoyang Zhai[1,2], and Xudong Zou[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

T4P.071 **AI-ENABLED E-SKIN WITH HIGH-ACCURACY MATERIAL AND TEXTURE RECOGNITION VIA STICK-SLIP AND CONTACT ELECTRIFICATION**
Jiahao Yu[1], Jiyuan Zhang[1], Aocheng Bao[1], Jin Wu[2], Bowen Ji[1], Honglong Chang[1], Weizheng Yuan[1], and Kai Tao[1]
[1] *Northwestern Polytechnical University, CHINA and*
[2] *Sun Yat-sen University, CHINA*

T4P.072 **A STRUCTURE-OPTIMIZED ACOUSTIC PARTICLE VELOCITY SENSOR WITH IMPROVED SENSITIVITY AND SELF-NOISE**
Wangnan Chen, Zhezheng Zhu, Xu Ma, Lingmeng Yang, Lihao Ma, Wenhua Xu, Chengchen Gao, Yilong Hao, and Zhenchuan Yang
Peking University, CHINA

T4P.073 **EVERYTHING AT ONCE-LINEARIZING SYSTEM RESPONSE AND ENHANCING SENSITIVITY IN PHOTOACOUSTIC GAS SENSORS BY DEDICATED DEMODULATION AND FILTER TUNING METHODS**
Simon Essing[1], David Tumpold[2], Guillaume Dumas[2], Andrey Kravchenko[3], Mohammadamir Ghaderi[2], and Gabriele Schrag[1]
[1] *Technical University of Munich, GERMANY,* [2] *Infineon Technologies AG, GERMANY, and* [3] *Infineon Technologies Dresden GmbH, GERMANY*

T4P.074 **FLEXIBLE CENTRALIZED TRI-AXIS FORCE SENSOR BASED ON CAPACITANCE AND INTRINSIC RESISTANCE OF BUMP STRUCTURE**
Jie Jin, Yancheng Wang, and Deqing Mei
Zhejiang University, CHINA

T4P.075 **FPGA-BASED ASYNCHRONOUS SPIKE PERCEPTRON FOR TINY MEMS TACTILE SENSORS**
Masanori Aoki[1], Tatsuya Saito[1], Mitsuhito Ando[1], Masayuki Sohgawa[2], Tomonori Izumi[1], Junichi Akita[3], and Haruo Noma[1]
[1] *Ritsumeikan University, JAPAN,* [2] *Niigata University, JAPAN, and* [3] *Kanazawa University, JAPAN*

T4P.076 **HIGH-SENSITIVE SLIP SENSOR FEATURING HIGH ASPECT RATIO MICROWALLS AND ITS MEASURING PRINCIPLE USING CONVOLUTIONAL NEURAL NETWORKS**
Motoki Ohashi, Shoki Kotani, Yusuke Tanaka, Masato Suzuki, Tomokazu Takahashi, and Seiji Aoyagi
Kansai University, JAPAN

T4P.077 **HUMAN ACTIVITY RECOGNITION USING INTELLIGENT RESONANT ACCELEROMETER EMPLOYING MEMS RESERVOIR COMPUTING**
Takahiro Mizumoto, Amit Banerjee, Jun Hirotani, and Toshiyuki Tsuchiya
Kyoto University, JAPAN

T4P.078 **MICRO-SENSORS WITH GIANT MAGNETOELECTRICAL COEFFICIENT**
KeLi Zhao, Peng Pang, Zhonggang Zhang, Guangyao Pei, Yunzhe Liu, Tao Zhang, Xingxu Zhang, Jian Luo, and Binghe Ma
Northwestern Polytechnical University, CHINA

T4P.079 **MICROSCOPIC BLOOD VISCOSITY MEASUREMENT USING OPTICAL FIBER TWEEZERS IMAGING SYSTEM**
Wei-Yu Chen, Ching-Jung Hung, and Cheng-Yang Liu
National Yang Ming Chiao Tung University, TAIWAN

T4P.080 **MONOLITHIC INTEGRATION OF GAS, HUMIDITY, ACCELERATION, MICROPHONE, TEMPERATURE AND PRESSURE COMPOSITE MICROCHIP**
Xiaohui Li[1,2], Xiawei Yue[1,2], Pingping Zhang[3], Heng Yang[1], Tiger H. Tao[1,2,4,5,6], and Nan Qin[1,2]
[1] *Chinese Academy of Sciences (CAS), CHINA,* [2] *University of Chinese Academy of Sciences, CHINA,* [3] *Suzhou Huiwen Nanotechnology Co., Ltd, CHINA,* [4] *Neuroxess Co., Ltd. (Jiangxi), CHINA,* [5] *Guangdong Institute of Intelligence Science and Technology, CHINA, and* [6] *Tianqiao and Chrissy Chen Institute for Translational Research, CHINA*

T4P.081 **MULTI-MODE PIEZOELECTRIC MICROMACHINED TRANDUCERS FOR MULTI-CHANNEL ACOUSTIC POWER TRANSFER AND DATA TELEMETRY**
Teng Zhang and Ashwin A. Seshia
University of Cambridge, UK

T4P.082 **NEAR ZERO-POWER ENVIRONMENT TEMPERATURE MICROMECHANICAL SENSOR-SWITCH ENABLED BY SUB-MICRON GAP**
Duan Jian Goh[1], Yul Koh[1], Sagnik Ghosh[1], Jaibir Sharma[1], Yong Shun Teo[1], Amit Lal[2], and Joshua E.Y. Lee[1]
[1] *Agency of Science Technology and Research (A*STAR), SINGAPORE and* [2] *Cornell University, USA*

T4P.083 **ON-LINE LASER POWER MEASUREMENT BASED ON MICROFABRICATED SENSOR DEVICE**
Yuqiang Hu[1,2,3], Fei Xie[2,4], Qihui Liu[2,4], Nan Wang[2,4], Jin Zhang[2], Yichen Liu[2], Yongquan Su[1,2,3], Lihao Wang[2,4], Hao Chen[2,4], and Zhenyu Wu[1,2,3,4]
[1] *Shanghai University, CHINA,* [2] *Chinese Academy of Sciences (CAS), CHINA,* [3] *Shanghai Industrial μTechnology Research Institute, CHINA, and* [4] *University of Chinese Academy of Sciences, CHINA*

T4P.084 **PIEZOELECTRIC MEMS ACOUSTIC EMISSION SENSOR MODULE WITH A BUILT-IN PREAMPLIFIER**
Yongfang Li, Yuki Ueda, Takashi Usui, and Kazuo Watabe
Toshiba Corporation, JAPAN

T4P.085 **SAW PRESSURE SENSOR ON LITHIUM NIOBATE USING A TRANFER OF SEPERATELY FABRICATED CAVITIES**
Sagun Shekhar, Ebinesh Abraham, and Prosenjit Sen
Indian Institute of Science, INDIA

T4P.086 **STIFFNESS IMBALANCE ERRORS TRIMMING FOR SILICON MEMS TUNING-FORK GYROSCOPES WITH LOW COST PICOSECOND LASERS**
Yuxian Liu, Qiancheng Zhao, Dacheng Zhang, and Jian Cui
Peking University, CHINA

T4P.087 **ULTRA-SENSITIVE PIEZORESISTIVE STRAIN SENSOR UTILISING LATERAL PHOTOVOLTAIC EFFECT IN 3C-SIC/SI HETEROJUNCTION**
Tuan-Hung Nguyen[1], Cong Thanh Nguyen[1], Dang D.H. Tran[1], Trung-Hieu Vu[1], Dinh Gia Ninh[1], Toan Dinh[2], Van T. Dau[1], and Dzung V. Dao[1]
[1] *Griffith University, AUSTRALIA and* [2] *University of Southern Queensland, AUSTRALIA*

WEDNESDAY - Physical Sensors and Microsystems

W4P.066 **3D ANISOTROPIC TACTILE SENSORS FOR NORMAL AND SHEAR FORCE DISCRIMINATION**
Kai-Ming Hu, Yi-Hang Xin, Xin-Lu Deng, Zhi-Qi Dong, Jing-Lin Ye, and Wen-Ming Zhang
Shanghai Jiao Tong University (SJTU), CHINA

W4P.067 **A FLEXIBLE, EMBROIDERED STRAIN SENSOR FOR USE WITH TEXTILES**
Yoshiki Kondo, Satoko Honda, and Kuniharu Takei
Osaka Metropolitan University, JAPAN

W4P.068 **A HIGHLY SENSITIVE ELECTROMECHANICAL SMALL CURRENT AMMETER**
Xuecui Zou, Usman Yaqoob, Khaled Salama, and Hossein Fariborzi
King Abdullah University of Science and Technology (KAUST), SAUDI ARABIA

W4P.069 **A NOVEL WALL-SHEAR STRESS SENSOR WITH A COVERING FLOATING ELEMENT FOR HARSH ENVIRONMENTS**
Yunzhe Liu, Guanghui Ding, Tao Zhang, Peng Pang, Keli Zhao, Guangyao Pei, Jian Luo, and Binghe Ma
Northwestern Polytechnical University, CHINA

W4P.070 **A SINGLE-INPUT SINGLE-OUTPUT SENSING SCHEME FOR MULTIPLE TRACES VIA HIGH-ORDER NONLINEAR MODE LOCALIZATION**
Wei Zhang, Jiajia Xiang, Na Ling, Jiayang Chen, Lijia Zhang, Cao Xia, Yuanlin Xia, and Zhuqing Wang
Sichuan University, CHINA

W4P.071 **A SELF-POWERED TACTILE SENSING INTERFACE FOR HUMAN-MACHINE INTERACTION**
Yuyang Sun, Hanyang Li, Kaiyao Wang, Xiaowei Feng, Cheng Hou, Tao Chen, and Huicong Liu
Soochow University, CHINA

W4P.072 **AN ULTRA-SENSITIVE HYDROGEL TACTILE SENSOR WITH MICRO-CONE STRUCTURES FOR HUMAN–MACHINE INTERFACE**
Aocheng Bao[1], Jiahao Yu[1], Jiyuan Zhang[1], Jin Wu[2], Bowen Ji[1], Honglong Chang[1], Weizheng Yuan[1], and Kai Tao[1]
[1] *Northwestern Polytechnical University, CHINA and* [2] *Sun Yat-sen University, CHINA*

W4P.073 **BY VARYING THE DISTANCE OF NI FLUX-GUIDE FOR OUT-OF-PLANE MAGNETIC FIELD SENSITIVITY ENHANCEMENT OF AMR SENSOR**
Shihwei Lin, Meifeng Lai, and Weileun Fang
National Tsing Hua University, TAIWAN

W4P.074 **DESIGN AND VALIDATION OF THE FIRST Z-AXIS MEMS ACCELEROMETER WITH IN-PLANE READOUT**
Gabriele Gattere[1], Valentina Zega[2], Manuel Riani[1], Francesco Rizzini[1], and Federico Maspero[2]
[1]*STMicroelectronics, ITALY and* [2]*Politecnico di Milano, ITALY*

W4P.075 **DEVELOPMENT OF THE NASA MINI/MEMS TRI-AXIS SENSOR SYSTEM**
Kenneth G. Toro[1] and Jonathon D. Ponder[2]
[1]*NASA Langley Research Center, USA and*
[2]*NASA Glenn Research Center, USA*

W4P.076 **ENHANCING LOW-FREQUENCY ACCELERATION RESOLUTION OF RESONANT ACCELEROMETERS BY MANIPULATING THE BIAS VOLTAGE NOISE**
Kunfeng Wang[1,2], Zheng Wang[1], Liangbo Ma[1,2], Zhaoyang Zhai[1,2], and Xudong Zou[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

W4P.077 **LARGE VERTICAL PIEZO-OPTOELECTRONIC EFFECT IN SIC/SI HETEROSTRUCTURE**
Cong Thanh Nguyen, Gia-Ninh Dinh, Tuan-Hung Nguyen, Trung-Hieu Vu, Dang D.H. Tran, Emily Lakis, Braiden Tong, Nam-Trung Nguyen, Van Thanh Dau, and Dzung Viet Dao
Griffith University, AUSTRALIA

W4P.078 **MICROSTRUCTURE-ENHANCED VISION-BASED TACTILE SENSOR**
Mayue Shi, Yongqi Zhang, Xiaotong Guo, and Eric M. Yeatman
Imperial College London, UK

W4P.079 **ONE STEP FABRICATION OF TRIAXIAL FORCE PLATE USING A FDM 3D PRINTER**
Yukitake Nakahara and Hidetoshi Takahashi
Keio University, JAPAN

W4P.080 **QUALITY FACTOR MODULATION IN MEMS RESONATORS BY ELASTIC WAVE INTERFERENCE IN THE ANCHOR REGION**
Daniel Platz, Marco Stixenberger, Andre Gesing, Ioan Igant, Hendrik Kähler, and Ulrich Schmid
TU Wien, AUSTRIA

W4P.081 **SELF-HEALING METAL INTERCONNECT USING SILICONE OIL DISPERSED WITH COPPER NANOPARTICLES**
Akane Umeda, Naoki Suetsugu, Wakana Akema, and Eiji Iwase
Waseda University, JAPAN

W4P.082 **SELF-OSCILLATING CALORIMETER BASED ON THERMAL-PIEZORESISTIVE RESONATOR**
Aojie Quan[1], Hemin Zhang[2], Chengxin Li[1], Chen Wang[1], Xinyu Wu[1], and Michael Kraft[1]
[1]*KU Leuven, BELGIUM and* [2]*Northwestern Polytechnical University, CHINA*

W4P.083 **TENSION-INDUCED MOEMS GRAPHENE RESONANT PRESSURE SENSOR**
Yujian Liu[1], Cheng Li[1,2], Zhengwei Wu[3], Shangchun Fan[2], Zhen Wan[1], and Song Han[4]
[1]*Beihang University, CHINA,* [2]*Shenzhen Institute of Beihang University, CHINA,* [3]*Chinese Academy of Sciences (CAS), CHINA, and* [4]*Southern University of Science and Technology, CHINA*

W4P.084 **UNCERTAINTY QUANTIFICATION OF MEMS DEVICES WITH HIGH-DIMENSIONAL CORRELATED PROCESS VARIATIONS**
Lin-Feng Zhao, Zai-Fa Zhou, and Qing-An Huang
Southeast University, CHINA

W4P.085 **UNCLOSED HEXAGONAL PIEZOELECTRIC MEMS HYDROPHONE BASED ON RIGID-FLEXIBLE COMPOSITE MEMBRANE**
Zhiyong Hu, Qi Wang, Qingda Xu, Tao Ruan, Bin Yang, and Jingquan Liu
Shanghai Jiao Tong University (SJTU), CHINA

MONDAY - RF MEMS, Resonators and Oscillators

M4P.088 **FULLY IMPEDANCE-MATCHED HIGH-OVERTONE BULK ACOUSTIC WAVE RESONATORS USING 2DEG ELECTRODES**
Jingjie Cheng, Jiahao Wu, Yan Qiao, Penghui Song, Wenming Zhang, and Lei Shao
Shanghai Jiao Tong University (SJTU), CHINA

M4P.089 **HIGH QUALITY FACTOR ALSCN LAMB WAVE RESONATORS USING NBN/AL TOP ELECTRODES AT CRYOGENIC TEMPERATURE**
Zhifang Luo[1,2,3,5], Shuai Shao[1,2,3], Peng Dong[1], Haowen Guo[1,4], Xinbo Zou[1,4], Jun Li[1], Chengkuo Lee[5], and Tao Wu[1,2,3,4]
[1]*ShanghaiTech University, CHINA,* [2]*Chinese Academy of Sciences (CAS), CHINA,* [3]*University of Chinese Academy of Sciences, CHINA,* [4]*Shanghai Engineering Research Center of Energy Efficient and Custom AI IC, CHINA, and* [5]*National University of Singapore, SINGAPORE*

M4P.090 **INVESTIGATION OF QUALITY FACTOR VARIATION BASED ON TAILORED MODE SHAPE ENGINEERING FOR PIEZOELECTRIC CONTOUR MODE RESONATORS**
Wei Lin and Sheng-Shian Li
National Tsing Hua University, TAIWAN

M4P.091 **STRESS INDUCED GAP CLOSING ELECTRODES FOR SILICON RESONATORS ENABLING LOW BIAS VOLTAGE AND EQUIVALENT RESISTANCE**
Hao Yu[1,2], Ke Sun[1], Chaoyue Zheng[1,2], Fang Wang[1,2], Heng Yang[1,2], and Xinxin Li[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and* [2]*University of Chinese Academy of Sciences, CHINA*

TUESDAY - RF MEMS, Resonators and Oscillators

T4P.088 **ALUMINUM SCANDIUM NITRIDE LAMB WAVE ACOUSTIC DELAY LINES WITH OVER 6% FRACTIOINAL BANDWIDTH**
Zhifang Luo[1,2,3,5], Shuai Shao[1,2,3], Chengkuo Lee[5], and Tao Wu[1,2,3,4]
[1]*ShanghaiTech University, CHINA,* [2]*Chinese Academy of Sciences (CAS), CHINA,* [3]*University of Chinese Academy of Sciences, CHINA,* [4]*Shanghai Engineering Research Center of Energy Efficient and Custom AI IC, CHINA, and* [5]*National University of Singapore, SINGAPORE*

T4P.089 **AN 18GZ ALSCN FILM BULK ACOUSTIC WAVE RESONATOR WITH EPITAXIAL METAL ELECTRODES**
Mingyo Park, Jialin Wang, and Azadeh Ansari
Georgia Institute of Technology, USA

T4P.090 **PARAMETRIC IMPEDANCE MODULATION IN DEPLETION LAYER TRANSDUCED MICROMECHANICAL RESONATOR**
Satish K. Verma and Bhaskar Mitra
Indian Institute of Technology Delhi, INDIA

T4P.091 **SHEAR BULK MODE RESONATOR WITH HIGH ELECTROMECHANICAL COUPLING USING X-CUT LITHIUM NIOBATE THIN FILM FOR WIDE BAND RF APPLICATIONS**
Seniz E. Kucuk Eroglu, Soumya Yandrapalli,
Victor Plessky, and Luis Guillermo Villanueva
École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND

T4P.092 **TEMPERATURE-COMPENSATED PURE SILICON CANTILEVER RESONATOR WITH COUPLED TORSIONAL STRUCTURE AT ANCHOR**
Shunsuke Yamada and Shuji Tanaka
Tohoku University, JAPAN

WEDNESDAY - RF MEMS, Resonators and Oscillators

W4P.086 **A MECHANICALLY COUPLED PIEZOELECTRIC MEMS FILTER BASED ON SUPPORT TRANSDUCER TOPOLOGY**
Ken-Wei Tang[1], Anurag Zope[1], Zhong-Wei Lin[1],
Gayathri Pillai[2], and Sheng-Shian Li[1]
[1]*National Tsing Hua University, TAIWAN and*
[2]*Indian Institute of Science, INDIA*

W4P.087 **A PIEZOELECTRIC WIDTH-FLEXURAL MODE MEMS RESONATOR WITH HIGH QUALITY FACTOR AND LOW MOTIONAL RESISTANCE**
Yuhao Xiao[1], Wen Chen[1], Jinzhao Han[1], Kewen Zhu[1],
and Guoqiang Wu[1,2]
[1]*Wuhan University, CHINA and* [2]*Hubei Yangtze Memory Laboratories, CHINA*

W4P.088 **A THERMO-PIEZORESISTIVE RESONATOR WITH F-Q PRODUCTS OVER 4.5E14**
Chaowei Si[1], Yongmei Zhao[1,2], Guowei Han[1], Jin Ning[1,2],
Xiaodong Wang[1,2], and Fuhua Yang[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA and*
[2]*University of Chinese Academy of Sciences, CHINA*

W4P.089 **GRAPHENE OXIDE INTEGRATED SURFACE ACOUSTIC WAVE HUMIDITY SENSOR WITH SIMULTANEOUS MULTI-FREQUENCY OPERATION**
Il Ryu Jang[1], Soon In Jung[1], Chaehyun Ryu[1], Jaeonhyung Park[1],
Aneeta Padhan[1], Jaesok Yu[1], Hohyun Keum[2], and Hoe Joon Kim[1]
[1]*Daegu Gyeongbuk Institute of Science and Technology (DGIST), KOREA and* [2]*Korea Institute of Industrial Technology (KITECH), KOREA*

W4P.090 **NON-LINEARITY CORRECTIONS OF TAPERED BAW TRANSDUCERS FOR ACCURATE FFT COMPUTATION USING ULTRASONIC WAVEFRONT COMPUTING**
Zaifeng Yang[1], Xing Haw Marvin Tan[1], Daniel Ssu-Han Chen[1], Bui Viet Phuong[1], Kevin Tshun Chuan Chai[1], Ching Eng Png[1], and Amit Lal[2]
[1]*Agency of Science Technology and Research (A*STAR), SINGAPORE and* [2]*Cornell University, USA*

MONDAY - Wearable and In-Vivo Medical Devices and Microsystems

M4P.092 **A FLEXIBLE LC-TYPE PASSIVE WIRELESS PRESSURE SENSOR FOR ATMOSPHERIC PRESSURE DETECTION**
Yifei Pan[1], Xilin Qian[1], Bowen Tian[1], Boshuai Sheng[1], Haonan Yang[1], Zhe Wu[1], Zefang Chen[1], Jiacheng Tu[1], Chengxi Guo[1], Huiyang Yu[1], and Jianqiu Huang[2]
[1]*Nanjing Tech University, CHINA and* [2]*Southeast University, CHINA*

M4P.093 **A UNIVERSAL CAVITY-BASED FORCE SENSOR WITH RECONFIGURABLE PERFORMANCE FOR INTEGRATION WITH THIN FILM DEVICES**
Zehua Xiang, Haobin Wang, Ji Wan, Chen Xu, Pengcheng Zhao, Mengdi Han, and Haixia Zhang
Peking University, CHINA

M4P.094 **A WIRELESS BACKSCATTER, BLUETOOTH LOW ENERGY (BLE)-COMPATIBLE BIOSIGNAL ACQUISITION SYSTEM FOR INTEGRATED BIOELECTRONICS**
Yashwanth Vyza, James D. Rosenthal, Alix Trouillet, Ivan Furfaro, and Stéphanie P. Lacour
École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND

M4P.095 **A WIRELESS HEADSET BIOSENSOR MEASURING VOLATILE CHEMICALS EMITTED FROM THE AURIS EXTERNA FOR MONITORING METABOLISMS**
Kenta Iitani[1], Huang Di[1], Geng Zhang[1], Koji Toma[2], Takahiro Arakawa[3], and Kohji Mitsubayashi[1]
[1]*Tokyo Medical and Dental University, JAPAN,* [2]*Shibaura Institute of Technology, JAPAN, and* [3]*Tokyo University of Technology, JAPAN*

M4P.096 **AN IMPLANTABLE PASSIVE WIRELESS TEMPERATURE SENSOR FOR MULTI-NODE MONITORING OF ARTIFICIAL KNEE JOINTS**
Zi-Ang Qi, Lei Dong, Qing-An Huang, Lei Han, and Meng Nie
Southeast University, CHINA

M4P.097 **IMPLANTABLE BIOSENSOR FOR CONTINUOUS SEROTONIN DETECTION IN FREELY MOVING CRAYFISH**
Jinjing Han, Tawen Ho, Justin M. Stine, Michael A. Straker, Jens Herberholz, and Reza Ghodssi
University of Maryland, USA

TUESDAY - Wearable and In-Vivo Medical Devices and Microsystems

T4P.093 **A TETRAPOLAR BIOIMPEDANCE SENSOR-INTEGRATED CAPSULE TOWARD TARGETED REAL-TIME MONITORING OF INTESTINAL TISSUES**
Brian M. Holt, Justin M. Stine, Luke A. Beardslee, and Reza Ghodssi
University of Maryland, USA

T4P.094 **A WEARABLE TRIPLE-SPIRAL SENSOR FOR IN-SITU REAL TIME SWEAT ANALYSIS BASED ON LASER INDUCED GRAPHENE**
Yaozheng Wang, Haobin Wang, Zehua Xiang, Pengchen Zhao, Yexing Fang, Ji Wan, Chen Xu, and Haixia Zhang
Peking University, CHINA

T4P.095 **CALIBRATION METHOD FOR WEARABLE SENSOR USING AIRFLOW AT MOUTH FOR QUANTITATIVE MONITORING OF RESPIRATION AND HEARTBEAT**
Kenta Horie[1], Muhammad Salman Al Farisi[1], Yoshihiro Hasegawa[1], Miyoko Matsushima[2], Tsutomu Kawabe[2], and Mitsuhiro Shikida[1]
[1]*Hiroshima City University, JAPAN and* [2]*Nagoya University, JAPAN*

T4P.096 **CANTILEVER ACTUATOR MODULE FOR ON-COMMAND DRUG DEPLOYMENT FROM INGESTIBLE CAPSULES**
Joshua A. Levy, Michael A. Straker, Luke A. Beardslee, and Reza Ghodssi
University of Maryland, USA

T4P.097 **DEVELOPMENT OF FLEX-TO-RIGID CAPACITIVE MICROMACHINED ULTRASOUND TRANSDUCER (CMUT) WITH BENDING MODULATION**
Sang-Mok Lee, Taemin Lee, Chaerin Oh, and Hyunjoo J. Lee
Korea Advanced Institute of Science and Technology (KAIST), KOREA

T4P.098 **SEROPILL: NOVEL MINIMALLY INVASIVE INGESTIBLE CAPSULE FOR SEROTONIN SENSING IN THE GI TRACT**
Michael A. Straker, Joshua A. Levy, Justin M. Stine, Jinjing Han, Luke A. Beardslee, and Reza Ghodssi
University of Maryland, USA

T4P.099 **SIMULTANEOUS AIRFLOW AND PRESSURE MEASUREMENTS BASED ON PITOT TUBE FOR EVALUATION OF EXPIRED AIR INSIDE LUNG AIRWAY**
Aoi Miyawaki[1], Muhammad Salman Al Farisi[1], Yoshihiro Hasegawa[1], Miyoko Matsushima[2], Tsutomu Kawabe[2], and Mitsuhiro Shikida[1]
[1]*Hiroshima City University, JAPAN and* [2]*Nagoya University, JAPAN*

WEDNESDAY - Wearable and In-Vivo Medical Devices and Microsystems

W4P.091 **HIGH-DENSITY ULTRA-FLEXIBLE NEURAL PROBE FOR MONITORING ELECTROPHYSIOLOGICAL SIGNALS OF FREE-MOVING MICE WITH EPILEPSY**
Han Wang[1,2], Qian Cheng[1,2], Cunkai Zhou[1,3], Ye Tian[1,2], Chengjian Xu[1,8], Xiaoling Wei[1,2], Zhitao Zhou[1,2], Tiger H. Tao[1,2,4,5,6,7], and Liuyang Sun[1,2]
[1]*Chinese Academy of Sciences (CAS), CHINA,* [2]*University of Chinese Academy of Sciences, CHINA,* [3]*Shanghai University of Electric Power, CHINA,* [4]*ShanghaiTech University, CHINA,* [5]*Neuroxess Co., Ltd. (Jiangxi), CHINA,* [6]*Guangdong Institute of Intelligence Science and Technology, CHINA,* [7]*Tianqiao and Chrissy Chen Institute for Translational Research, CHINA, and* [8]*University of Science and Technology of China, CHINA*

W4P.092 **IMPLANTABLE IN-VIVO PH IMAGE SENSOR WITH INTEGRATED REFERENCE ELECTRODE FOR BIOLOGICAL EXPERIMENTS ON AWAKE MOUSE**
Mai Madokoro[1], Yuto Nakamura[1], Hiroshi Horiuchi[2], Tomoko Kobayashi[2], Junko Ishida[2], Tomoko Horio[1], Yasuyuki Kimura[1], Takeshi Hizawa[1], Daisuke Akai[1], Hideo Doi[1], Yong-Joon Choi[1], Kazuhiro Takahashi[1], Toshihiko Noda[1], Junichi Nabekura[2], and Kazuaki Sawada[1]
[1] *Toyohashi University of Technology, JAPAN and*
[2] *National Institute for Physiological Sciences, JAPAN*

W4P.093 **MAGNETOELECTRIC NANOPARTICLE BASED WEARABLE ENERGY HARVESTER FOR POWERING BIO-MEDICAL DEVICES**
Nandan Murali[1], Dibyajyoti Mukherjee[1], G Vijay Malhaar[2], Dhiman Mallick[1], and Soutik Betal[1]
[1] *Indian Institute of Technology Delhi, INDIA and*
[2] *Birla Institute of Technology and Science-Pilani (BITS–Pilani), INDIA*

W4P.094 **MULTIFUNCTIONAL NEURAL PROBE FOR SYNCHRONIZED STIMULATION AND MONITORING MULTIPLE SIGNALS**
Jiawei Cao, Longchun Wang, Zhejun Guo, Zhuo Wang, Kejun Tu, Qingda Xu, Mengfei Xu, Junyu Xiao, Bin Yang, and Jingquan Liu
Shanghai Jiao Tong University (SJTU), CHINA

W4P.095 **STRETCHABLE HYBRID ELECTRONICS BASED ON AUXETIC STRUCTURES**
Daniel Zymelka, Toshihiro Takeshita, Yusuke Takei, and Takeshi Kobayashi
National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

W4P.096 **UTILIZING ORIGAMI INTEGRATED PIEZOELECTRIC FOIL ACOUSTIC EMISSION AND ACCELERATION SENSOR FUSED WITH OMNIDIRECTIONAL MOTION DETECTOR FOR KNEE JOINT HEALTH MONITORING**
Cheng-Da Lin and Guo-Hua Feng
National Tsing Hua University, TAIWAN

W4P.097 **WIRELESS URINE MONITORING FOR DIAPERS WITH PASSIVE ANNTENA USING SPLIT RING METAMATERIAL**
Ashitaka Kurita[1], Gaku Furusawa[1], Hiroaki Onoe[2], and Tetsuo Kan[1]
[1] *University of Electro-Communications, JAPAN and*
[2] *Keio University, JAPAN*

M4P.098 **A 0.6 METER LONG LARGE-AREA FLEXIBLE PRESSURE SENSORS WITH OUTSTANDING UNIFORMITY AND THERMOSTABILITY**
Shoulu Gong, Ding Zhe Gan, Xinlu Deng, Wenming Zhang, and Lei Shao
Shanghai Jiao Tong University, CHINA

M4P.099 **A MICROFLUIDIC PLATFORM FOR ENHANCED LABELLING AND DETECTION OF EXTRACELLULAR VESICLES**
Shi Hu, Rui Hao, Zitong Yu, Huitao Zhang, Qisang Zuo, and Hui Yang
Chinese Academy of Sciences (CAS), CHINA

M4P.100 **A PLASMONIC-PHOTONIC HYBRID FIBER-OPTIC SENSOR FOR TUMOR MARKER DETECTION AND HETEROGENEITY CHARACTERIZING**
Nanxi Wang[1,2], Xin Li[1,2], Yimin Shi[1,2], Fei Wang[1,2], Lina Zhang[3], Mingxiao Li[1], Hongyao Liu[1], Yang Zhao[1], Lingqian Zhang[1], and Chengjun Huang[1,2]
[1] *Chinese Academy of Sciences, CHINA,* [2] *University of Chinese Academy of Sciences, CHINA, and* [3] *Beijing Chest Hospital, Capital Medical University, CHINA*

M4P.101 **A STUDY OF FERROELECTRIC POLARIZATION SWITCHING AND NEGATIVE CAPACITANCE EFFECT FOR ENHANCED ENERGY STORAGE IN ON-CHIP ELECTROSTATIC SUPERCAPACITORS**
Sadegh Kamaei, Michele Ghini, Ali Gilani, Carlotta Gastaldi, and Adrian M. Ionescu
École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND

M4P.102 **ACTIVE CONTROL OF VIBRATION-INDUCED FLOW USING A PNEUMATICALLY DRIVEN MICROBALLOON DEVICE**
Taku Sato, Kanji Kaneko, Takeshi Hayakawa, and Hiroaki Suzuki
Chuo University, JAPAN

M4P.103 **BEOL COMPATIBLE (< 400 °C) NOVEL CROSS-POINT RRAM BASED RESISTIVE HYDROGEN SENSOR FOR DOWNSTREAM HYDROGEN USE**
Subhranu Samanta, Zhixian Chen, Doris K.T. Ng, Weiguo Chen, Linfang Xu, Fuu Ming Kai, and Yao Zhu
*Agency for Science, Technology and Research (A*STAR), SINGAPORE*

M4P.104 **CRYSTALLIZATION OF DNA-FUNCTIONALIZED NANOPARTICLE IN GIANT UNILAMELLAR VESICLES**
Ryuta Tetsuya[1], Naotomo Tottori[1], Azusa Takao[1], Maasa Yokomori[1], Miho Tagawa[2], Shigeo S. Sugano[3], Shinya Sakuma[1], and Yoko Yamanishi[1]
[1] *Kyushu University, JAPAN,* [2] *Nagoya University, JAPAN, and* [3] *National Institute of Advanced Industrial Science and Technology (AIST), JAPAN*

M4P.105 **EFFECT OF VAN DER WAALS FORCES ON DYNAMIC PROPERTIES OF GRAPHENE-BASED NEMS RESONATORS**
Zhi-Qi Dong, Kai-Ming Hu, Xin-Lu Deng, Yi-Hang Xin, You-Lang He, and Jing-Lin Ye
Shanghai Jiao Tong University, CHINA

M4P.106 **EVALUATION METHOD OF OUT-OF-PLANE DEFORMATION ON KIRIGAMI STRUCTURE WITH REPETITIVE SLIT PATTERNS ON CONCENTRIC CIRCLES**
Miyako Mizuna and Eiji Iwase
Waseda University, JAPAN

M4P.107 **FABRICATION OF A MOVING-COIL-TYPE PDMS-BASED MEMBRANE ELECTROMAGNETIC MICRO-ACTUATOR BY DOUBLE-SIDED SCREEN PRINTING TECHNOLOGY**
Chao Qi, Naohiro Sugita, and Tadahiko Shinshi
Tokyo Institute of Technology, JAPAN

M4P.108 **FLEXIBLE THERMOPILE-TYPE WARMTH SENSOR**
Minoru Sasaki[1], Yoshiyuki Hata[2], and Yae Ito[1]
[1] *Toyota Technological Institute, JAPAN and* [2] *Meijo University, JAPAN*

M4P.109 **HIGH CRYSTALLINE QUALITY A-AXIS ORIENTED $AL_{0.56}SC_{0.44}N$ FILMS FOR HIGH COUPLING SAW APPLICATIONS**
Weipeng Xuan[1], Weilun Xie[1], Xiwei Huang[1], Xingli He[2], Zhen Cao[3], Hao Jin[3], Shurong Dong[3], and Jikui Luo[3]
[1] *Hangzhou Dianzi Univerisity, CHINA,* [2] *Soochow University, CHINA and* [3] *Zhejiang University, CHINA*

M4P.110 **HIGH-THROUGHPUT SPERM SORTING MICROFLUIDIC DEVICE FOR LIVESTOCK'S SPERM MOTILITY ENHENCEMENT**
Nian-Je Wu[1], Hsien-Chih Peng[1], I-Jui Chen[1], Ren-Guei Wu[1], and Fan-Gang Tseng[1,2]
[1] *National Tsing Hua University, TAIWAN and* [2] *Academia Sinica, TAIWAN*

M4P.111 **IMAGING RESONANT MEMS WITH ULTRA-BROAD SPECTRAL VIBROMETRY FROM 1000 HZ TO 10 GHZ**
Zhao-Liang Peng, Jing-Jie Cheng, Jia-Hao Wu, Lei Shao, and Wen-Ming Zhang
Shanghai Jiao Tong University, CHINA

M4P.112 **LITHIUM NIOBATE THIN FILM RESONANT INFRARED DETECTOR**
Mingye Du[1], Kangfu Liu1[,2,3], Jiawei Li[1], Yuxi Wang[1,2,3], Yushuai Liu[1,2,3], Fengyu Liu[1], and Tao Wu[1,2,3,4]
[1] *ShanghaiTech University, CHINA,* [2] *Chinese Academy of Sciences (CAS), CHINA,* [3] *University of Chinese Academy of Sciences, CHINA, and* [4] *Shanghai Engineering Research Center of Energy Efficient and Custom AI IC, CHINA*

M4P.113 **MACHINE LEARNING ASISTED WAFER LEVEL BATCH FABRICATION OF AN MRI-COMPATIBLE MUNTIFUNCTIONAL NEURAL PROBE**
Ziqi Jia, Shuyu Shi, and Yong-Kyu "YK" Yoon
University of Florida, USA

M4P.114 **MICROFLUIDIC 3D HEPATIC CULTURES INTEGRATED WITH DROPLET-BASED BIOANALYSIS UNIT FOR MONITORING GLUCOSE METABOLISM UPON HORMONAL STIMULATION**
Jose M. de Hoyos-Vega[1], Alan M. Gonzalez-Suarez[1], Diana F. Cedillo-Alcantar[1], Gulnaz Stybayeva[1], Aleksey Matveyenko[1], Harmeet Malhi[1], Jose L. Garcia-Cordero[2], and Alexander Revzin[1]
[1] *Mayo Clinic, USA and* [2] *Centro de Investigación y de Estudios Avanzados del IPN, MEXICO*

M4P.115 **MULTIFUNCTIONAL SENSING AND ACTUATION MINIATURIZED SYSTEM FOR BLOOD BIOMARKERS ON A BEAD**
Udara B. Gunatilake[1], Adriana Caballe-Abalos[1], Sandra Garcia-Rey[1], Jon Mercader-Ruiz[1,2], Lourdes Basabe-Desmonts[1,3], and Fernando Benito-Lopez[1]
[1] *University of the Basque Country, SPAIN,* [2] *Arthroscopic Surgery Unit-UCA, SPAIN, and* [3] *Basque Foundation of Science, IKERBASQUE, SPAIN*

M4P.116 **PIEZOELECTRIC MEMS OSCILLATORS BASED ON FLEXURAL MODE MEMBRANE RESONATOR ARRAY FOR RESONANT SENSORS**
Hexu Luo, Menglun Zhang, Yi Gong, Yuan Ning, Xuejiao Chen, Quanning Li, and Wei Pang
Tianjin University, CHINA

M4P.117 **SELF-POWERED INTRUSION DETECTING SYSTEM USING A SPRAY-PAINT COATING BASED TRIBOELECTRIC NANOGENERATOR**
Jonghyeon Yun and Daewon Kim
Kyung Hee University, KOREA

M4P.118 **SIZE-BASED SEPARATION OF E. COLI USING VISCOELASTIC MICROFLUIDICS**
Tianlong Zhang[1,2], Ling Liu[1], David W. Inglis[1], Yoichiroh Hosokawa[2], Yaxiaer Yalikun[2], and Ming Li[1]
[1] *Macquarie University, AUSTRALIA and* [2] *Nara Institute of Science and Technology, JAPAN*

M4P.119 **TEXTURING TO DRAMATICALLY INCREASE THERMAL DEFORMATION OF FILM AND APPLYING TO ACTUATOR**
Daisuke Yamaguchi, Yuki Takahara, Shuichi Wakimoto, and Takefumi Kanda
Okayama University, JAPAN

M4P.120 **THERMAL RECOVERY OF PALLADIUM NANOWIRE SENSOR FOR LONG-TERM RELIABLE HYDROGEN GAS DETECTION**
Ki-Hoon Kim[1], Min-Seung Jo[2], Jun-Bo Yoon[2], and Min-Ho Seo[1]
[1] *Pusan National University, KOREA and* [2] *Korea Advanced Institute of Science and Technology (KAIST), KOREA*

M4P.121 **WEARABLE AND HYBRID POWER SOURCES FOR SMART CONTACT LENSES**
Shiqi Wu, Yi Ding, Lunjie Hu, Daniella Gatus, Wakutaka Nakagawa, and Takeo Miyake
Waseda University, JAPAN

TUESDAY - Late News

T4P.100 **A BIMODAL "SENSOR CHIPLET" PLATFORM APPLIED FOR ALBUMIN AND PH MULTI-CHEMICAL SENSING**
Ryugo Shimamura[1], Shun Yasunaga[1], Kei Misumi[1], Anne-Claire Eiler[1], Akio Higo[1], Gilgueng Hwang[1,2], Ayako Mizushima[1], Dongchen Zhu[1], Kikuo Komori[3], Yasuyuki Sakai[1], Hiroshi Toshiyoshi[1], Agnès Tixier-Mita[1], and Yoshio Mita[1]
[1] *University of Tokyo, JAPAN,* [2] *Paris-Saclay University, FRANCE, and* [3] *Kindai University, JAPAN*

T4P.101 **A MOLECULARLY IMPRINTED POLYMER /METHYLENE BLUE/ANODIC ALUMINUM OXIDE (MIP/MB/AAO) NANOCOMPOSITE ELECTRODE FOR THE DETECTION OF ULTRA-LOW CONCENTRATION TROPONIN T IN URINE**
Chieh Chen[1], Yu-Ting Cheng[1], and Hsiao-En Tsai[2,3]
[1]*National Yang Ming Chiao Tung University, TAIWAN,*
[2]*National Taiwan University Hospital, TAIWAN, and*
[3]*National Taiwan University College of Medicine, TAIWAN*

T4P.102 **A SMART REAL-TIME HUMAN RESPIRATORY MONITORING SYSTEM BASED ON A HIGH-PERFORMANCE FLOW SENSOR AND AN ACCURATE BREATHING RATE RECOGNITION ALGORITHM**
Shiqian Cai, Zhongyi Liu, Gai Yang, Houbo Ding,
Huikai Xie, and Xiaoyi Wang
Beijing Institute of Technology, CHINA

T4P.103 **ELECTROCHEMICAL SENSOR FOR INGESTIBLE CAPSULE-BASED IN-VIVO DETECTION OF HYDROGEN SULFIDE**
Justin M. Stine, Katie L. Ruland, Joshua A. Levy,
Luke A. Beardslee, and Reza Ghodssi
University of Maryland, USA

T4P.104 **ADEPT - AN EMBEDDED MICROSYSTEMS MULTI-ELECTRODE CONTROL PLATFORM FOR VERSATILE µm-PRECISION POSITIONAL TRAPPING AND ELECTROROTATION**
Lourdes Albina Nirupa Julius, Dora Akgül, Gowri Krishnan,
Henrik Scheidt, Omar Nassar, Sarai M. Torres-Delgado,
Dario Mager, Vlad Badilita, and Jan G. Korvink
Karlsruhe Institute of Technology, GERMANY

T4P.105 **BROADBAND POWER GENERATION FROM ARM SWING DURING WALKING BY REPULSIVE-TORQUE-ENHANCED ROTATIONAL ELECTRET ENERGY HARVESTER**
Tomoya Miyoshi and Yuji Suzuki
University of Tokyo, JAPAN

T4P.106 **DEVELOPMENT OF DIGITAL NANOPLASMONMETRY METHOD FOR LABEL-FREE DETECTIONS OF SMALL BIOMOLECULES**
Ting-Wei Chang, Sheng-Hann Wang, and Pei-Kuen Wei
Academia Sinica, TAIWAN

T4P.107 **ELECTRICAL IMPEDANCE SPECTROSCOPY OF SINGLE PARTICLES BY AC NANOPORE METHOD -TOWARD EVALUATION OF DIELECTRIC PROPERTIES OF SINGLE NANOPARTICLES**
Kosuke Hori, Ryusei Kowaka, Maami Sakamoto,
and Takatoki Yamamoto
Tokyo Institute of Technology, JAPAN

T4P.108 **EXTREMELY SMALL LIMITING-CURRENT-TYPE OXYGEN SENSOR WITH A WIDE RANGE PROPORTIONALITY OF THE OXYGEN CONCENTRATION**
Shunsuke Akasaka[1] and Isaku Kanno[2]
[1]*ROHM Co. Ltd, JAPAN and* [2]*Kobe University, JAPAN*

T4P.109 **FABRICATION OF MEMS BULK SIC-BASED ACCELEROMETER AND ITS APPLICATION IN GROUND TEST OF AERO-ENGINE**
Yanxin Zhai[1,2], Tiantong Xu[1,2], Guoqiang Xu[1,2], Hengyi Wang[1,2], Xiaoda Cao[1,2], and Haiwang Li[1,2]
[1]*Beihang University, CHINA and* [2]*National Key Laboratory of Science and Technology on Aero Engine Aero-Thermodynamics, CHINA*

T4P.110 **FLUORESCENT POLYMERIC NANO-THERMOMETER FOR 3D TEMPERATURE DISTRIBUTION AND DYNAMIC MONITORING OF CHIMERIC TUMOR MICROENVIRONMENT**
Ashish Kumar[1], Venkanagouda S. Goudar[1], Kiran Kaladharan[1], Tuhin Subhra Santra[2], and Fan-Gang Tseng[1,3]
[1]*National Tsing Hua University, TAIWAN,* [2]*Indian Institute of Technology Madras, INDIA, and* [3]*Academia Sinica, TAIWAN*

T4P.111 **HIGH-PERFORMANCE PIEZOELECTRIC BIOMATERIALS FOR BIOCOMPATIBLE ENERGY HARVESTERS AND SENSORS**
Zhuomin Zhang[1,2], Xuemu Li[1,2], Zhenqi Wang[1], and Zhengbao Yang[1,2]
[1]*City University of Hong Kong, HONG KONG and*
[2]*Hong Kong University of Science and Technology, HONG KONG*

T4P.112 **HIGHLY STRETCHABLE, SUPER-TOUGH AND ANTI-BACTERIAL DEEP EUTECTIC SOLVENT IONIC GEL FOR HUMAN MOTION SENSING**
Jia-Yu Yang and Cheng-Hsin Chuang
National Sun Yat-sen University, TAIWAN

T4P.113 **IMMUNOGENICITY MONITORING SYSTEM INCORPORATING MICROFLUIDIC CELL CHIP AND PAPER-BASED ANALYTICAL DEVICE**
Kyung Won Lee, Eun Kyeong Yang, and Hyun Chul Yoon
Ajou University, KOREA

T4P.114 **LOW ELASTIC SPIN TORQUE SENSOR BASED ON ANGULAR MOMENTUM CONSERVATION LAW**
Masaya Toda, Kohei Oka, and Takahito Ono
Tohoku University, JAPAN

T4P.115 **MICRO PLASMA GENE TRANSFECTION SYSTEM FOR UNIFORM EXPRESSION**
Seiya Kato[1], Yuto Ando[1], Kiichiro Tomoda[2], Mime Kobayashi[3], and Shinya Kumagai[1]
[1]*Meijo University, JAPAN,* [2]*Gladstone Institutes, USA, and* [3]*Osaka Medical and Pharmaceutical University, JAPAN*

T4P.116 **MODE-MATCHED MULTI-RING DISK RESONATOR USING (100) SINGLE CRYSTAL SILICON WITH 2 PPM FREQUENCY MISMATCH**
Shihe Wang, Jianlin Chen, Takashiro Tsukamoto, and Shuji Tanaka
Tohoku University, JAPAN

T4P.117 **ON-CHIP DIAMOND MEMS RESONATORS MAGNETIC SENSING UP TO 500°C**
Zilong Zhang[1], Guo Chen[1], Guangchao Chen[2], Satoshi Koizumi[1], Yasuo Koide[1], and Meiyong Liao[1]
[1]*National Institute for Materials Science (NIMS), JAPAN and*
[2]*University of Chinese Academy of Sciences, CHINA*

T4P.118 **RESIDUAL STRESS ANALYSIS OF THIN FILM MATERIALS FOR FABRICATING SUSPENDED LOW STRESS SI_3N_4 WAVEGUIDES ON SAPPHIRE**
Erwin Berenschot, Simen Martinussen, Kai Wang, Sonia García-Blanco, Niels Tas, and Roald Tiggelaar
University of Twente, NETHERLANDS

T4P.119 **SELF-POWERED WIRELESS WIND SPEED SENSOR BASED ON AN ELECTRET GENERATOR**
Junchi Teng, Zeyuan Cao, Zibo Wu, Rong Ding, and Xiongying Ye
Tsinghua University, CHINA

T4P.120 **SOLIDLY MOUNTED TWO-DIMENSIONAL GUIDED MODES IN 30% SCANDIUM ALUMINUM NITRIDE ON SAPPHIRE**
Jack Guida, Gabriel Giribaldi, Luca Colombo, Matteo Rinaldi, and Siddhartha Ghosh
Northeastern University, USA

T4P.121 **THE MAXIMUM ELECTROWETTING FORCE ON DROPLETS**
Robert M. Hennig[1], Vito Cacucciolo[2], and Herbert Shea[1]
[1]*École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND and* [2]*Politecnico di Bari, ITALY*

T4P.122 **VIRTUAL PARTICLE VALVE TOWARD GENERATION OF DOUBLE-CELLS ENCAPSULATED MICRODROPLET**
Yuma Kadomura, Naotomo Tottori, Shinya Sakuma, and Yoko Yamanishi
Kyushu University, JAPAN

T4P.123 **WSE_2/$SNSE_2$ HETEROSTRUCTURE TUNNEL FIELD-EFFECT TRANSISTOR FOR PH SENSING**
Xian Wu[1,2], Haojie Zhao[1,2], and Peng Li[1,2]
[1]*Tsinghua University, CHINA and* [2]*Beijing Advanced Innovation Center for Integrated Circuits, CHINA*

WEDNESDAY - Late News

W4P.098 **A MICROFLUIDIC CHIP TO BOOST SECRETION OF EXTRACELLULAR VESICLES VIA CELL SQUEEZING**
Shi Hu, Rui Hao, Xi Chen, Huitao Zhang, Zitong Yu, Yi Zhang, Lin Zeng, and Hui Yang
Chinese Academy of Sciences (CAS), CHINA

W4P.099 **A MONOLITHIC INTEGRATED MEMS ACOUSTIC DYADIC SENSOR**
Lingmeng Yang, Zhezheng Zhu, Wangnan Chen, Xu Ma, Lihao Ma, Chengchen Gao, Yilong Hao, and Zhenchuan Yang
Peking University, CHINA

W4P.100 **A STRETCHABLE RESISTIVE STRAIN SENSOR BASED ON CRACK PROPAGATION, OPENING AND BLUNTING: DEVICE AND MECHANICS**
Katherine Moody, Shuang Wu, and Yong Zhu
North Carolina State University, USA

W4P.101 A TWO DEGREE-OF-FREEDOM MEMS MIRROR DRIVEN BY INTERNAL RESONANCE USING PIEZOELECTRIC TRANSDUCERS
Changhao Wang[1,2], Jianlin Chen[1,2], Nan Wang[1,3], and Yuandong Gu[1]
[1] *Shanghai University, CHINA,* [2] *State Key Laboratory of Transducer Technology, CHINA, and* [3] *Shanghai Key Laboratory of Chips and Systems for Intelligent Connected Vehicle, CHINA*

W4P.102 ADVANCING INFRARED SENSING WITH HIGH-TCF 30%-DOPED SCALN RESONATORS AND ALN METAMATERIAL ABSORBERS
Farah ben Ayed, Aurelio Venditti, Gabriel Giribaldi, Ryan Tetro, Sila Deniz Calisgan, Pietro Simeoni, Zhenyun Qian, and Matteo Rinaldi
Northeastern University, USA

W4P.103 CRYSTAL ORIENTATION AND SPECIMEN SIZE DEPENDENCES OF CREEP PROPERTIES OF MICRON-THICK SILICON FOR 3D MICROSTRUCTURED MEMS
Takanori Horikawa, Kazuma Sawada, Akio Uesugi, Koji Sugano, and Yoshitada Isono
Kobe University, JAPAN

W4P.104 DUAL-MODE SURFACE LATTICE RESONANCES IN ASYMMETRIC OPTICAL METASURFACES FOR REFRACTIVE INDEX SENSING
Liye Li[1] and Wengang Wu[1,2]
[1] *Peking University, CHINA and* [2] *Beijing Advanced Innovation Center for Integrated Circuits, CHINA*

W4P.105 ENCAPSULATION OF MICRORNAS IN EXOSOMES FOR EFFICIENT INTRACELLULAR DELIVERY BY A NANOFLUIDIC PLATFORM
Zitong Yu[1], Rui Hao[1], Sihui Chen[2], Huitao Zhang[1], Shi Hu[1], Jingyi Ren[1], Yanhang Hong[1], Bingrun Liu[2], Qisang Zuo[1], and Hui Yang[1]
[1] *Chinese Academy of Sciences (CAS), CHINA and* [2] *SomesTech Co., Ltd., CHINA*

W4P.106 FABRICATION AND CHARACTERIZATION OF POLYCARBONATE SUBSTRATES FOR HIGH YIELD ASSEMBLY OF MULTICOMPONENT BIOHYBRID MICROROBOTS
Taryn Imamura, Utku M. Sonmez, Matthew Travers, Sarah Bergbreiter, and Rebecca E. Taylor
Carnegie Mellon University, USA

W4P.107 FABRICATION OF STRAIN-INDUCED GRAPHENE RESONANT MASS SENSOR USING ELASTOMER NANOSHEET FOR MOLECULAR DETECTION
Motoki Kato[1], Ken Aran[o1], Masato Saito[2], Toshinori Fujie[2], Tatsuro Goda[3], Yong Joon Choi[1], Toshihiko Noda[1], Kazuaki Sawada[1], and Kazuhiro Takahashi[1]
[1] *Toyohashi University of Technology, JAPAN,*
[2] *Tokyo Institute of Technology, JAPAN, and*
[3] *Toyo University, JAPAN*

W4P.108 A NOVEL THERMAL NOISE ACTUATED PRESSURE SENSOR
Yan Qiao[1], Alaaeldin Elhady[2], Mohamed Arabi[3], Eihab Abdel-Rahman[2], and Wen-Ming Zhang[1]
[1] *Shanghai Jiao Tong University, CHINA,* [2] *University of Waterloo, CANADA, and* [3] *Applied Science University, BAHRAIN*

W4P.109 **HIGH-SENSITIVITY FIBER TIP SENSOR BASED ON DARK PLASMONIC RESONANCE MODE**
Fei Wang[1,2], Xin Li[1,2], Siyuan Wang[1,2], Yitao Cao[1,2], Xuqing Sun[1,2], Nanxi Wang[1,2], Lingqian Zhang[1], Hongyao Liu[1], Xinchao Lu[1], and Chengjun Huang[1,2]
[1] *Chinese Academy of Sciences (CAS), CHINA and*
[2] *University of Chinese Academy of Sciences, CHINA*

W4P.110 **HYDROTHERMALLY MODIFIED Pd NANOPARTICLES DECORATED TiO_2 NANOSPHERES FOR VISIBLE LIGHT INDUCED ROOM TEMPERATURE HYDROGEN SENSING**
Thilini Thathsara, Christopher J. Harrison, Rosalie K. Hocking, and Mahnaz Shafiei
Swinburne University of Technology, AUSTRALIA

W4P.111 **INFLUENCE OF PERMANENT MAGNETIC PROPERTIES ON MAGNETIC PATTERN TRANSFER FOR MAGNETIC MEMS**
Keita Nagai, Naohiro Sugita, and Tadahiko Shinshi
Tokyo Institute of Technology, JAPAN

W4P.112 **LOW-POWER CO_2 GAS SENSOR BASED ON ELECTROLYSIS-INDUCED BUBBLES**
Steven Tran, Seungbeom Noh, and Hanseup Kim
University of Utah, USA

W4P.113 **MICROFABRICATED PLATFORM FOR DIRECTIONAL NEURAL MICROCIRCUITS IN SILICON-GLASS**
Dean de Boer[r1], Torben W. van Voorst[2], Erwin J.W. Berenschot[1], L. Niels Cornelisse[2], and Niels R. Tas[1]
[1] *University of Twente, NETHERLANDS and*
[2] *Vrije Universiteit Amsterdam, NETHERLANDS*

W4P.114 **MULTI HEAT-SINK CMOS-BEOL INTEGRATED MEMS PIRANI GAUGE FOR VACUUM DETECTION IN PACKAGED MICROSENSORS**
Manu Garg[1,2], Fang Wei Tsai[2], Sushil Kumar[1], Yi Chiu[2], and Pushpapraj Singh[1]
[1] *Indian Institute of Technology Delhi (IITD), INDIA and*
[2] *National Yang Ming Chiao Tung University, TAIWAN*

W4P.115 **ON-CHIP MAGNETOTHERMAL SYSTEM FOR SINGLE MICRO-PARTICLE HEATING**
Lin Zeng[1], Shengyu Wang[1], Hongwei Guan[2], Qisang Zuo[1], Yi Zhang[1], and Hui Yang[1]
[1] *Chinese Academy of Sciences (CAS), CHINA and*
[2] *Dalian Maritime University, CHINA*

W4P.116 **SELF-HEATING GAS SENSOR USING HETEROJUNCTION NANOWIRE ARRAY FOR HIGH SENSITIVITY AND LOW POWER CONSUMPTION**
Sung-Ho Kim[1], Min-Seung Jo[1], So-Yoon Park[1], Kwang-Wook Choi[1,2], Sang-Hee Kim[1,2], Jae-Young Yoo[3], Beom-Jun Kim[1], and Jun-Bo Yoon[1]
[1] *Korea Advanced Institute of Science and Technology (KAIST), KOREA,* [2] *Samsung Electronics Co., Ltd, KOREA, and* [3] *Northwestern University, USA*

W4P.117 **SENSING THE POINT DEFECTS BY SINGLE-CRYSTAL DIAMOND MEMS RESONATORS**
Guo Chen[1,2], Zilong Zhang[1], Liwen Sang[1], Yasuo Koide[1], Satoshi Koizumi[1], Zhaohui Huang[2], and Meiyong Liao[1]
[1]*National Institute for Materials Science, JAPAN and*
[2]*China University of Geosciences, CHINA*

W4P.118 **STEP-AND-REPEAT UV NANOIMPRINT USING PFP GAS FOR REALIZING MICRONEEDLE ARRAY WITH JAGGED TIP SHAPE BIOINSPIRED BY MOSQUITO**
Seiji Aoyagi, Hiroki Hamada, Tomokazu Takahashi, and Masato Suzuki
Kansai University, JAPAN

W4P.119 **THE MICROFLUIDIC MICROWELL ARRAY INTEGRATING SURFACE ENHANCED RAMAN SCATTERING (SERS) PLATFORM ASSISTED WITH MACHINE LEARNING FOR BACTERIA STRAIN IDENTIFICATION**
Po-Hsuan Chao and Nien-Tsu Huang
National Taiwan University, TAIWAN

W4P.120 **VISUALIZATION OF ODOR SOURCE LOCALIZATION REALIZED BY SERS GAS SENSOR**
Lin Chen, Hao Guo, Takuya Matsuo, Fumihiro Sassa, and Kenshi Hayashi
Kyushu University, JAPAN

京都　三千院・シャクナゲ (Sanzen-in Temple garden in Kyoto)
(Image by Route16; AdobeStock).


TRANSDUCERS
KYOTO JAPAN 2023
www.transducers2023.org