Preliminary Program

Conference Chairs:
Núria Barniol, *Universitat Autonoma de Barcelona, SPAIN*
Franz Lärmer, *Robert Bosch GmbH, GERMANY*

Conference Location:
Science Congress Center Munich

Sponsored by:

IEEE

MEMS
IEEE MEMS TECHNICAL COMMUNITY

The Executive Committee has the right to change dates and times if needed.

Sunday, 15 January

All times are Central European Time (CET).

Industry Session

13:00 – 17:00

17:00 – 19:00 **Conference Registration and Check-In**

Welcome Reception

17:00 – 19:00

Monday, 16 January

All times are Central European Time (CET).

Welcome Address

08:00 **MEMS 2023 Conference Chairs**
Núria Barniol, *Universitat Autonoma de Barcelona, SPAIN*
Franz Lärmer, *Robert Bosch GmbH, GERMANY*

• IEEE Fellows Recognition in the Field of MEMS/NEMS
• IEEE Electron Devices Society Robert Bosch Micro and Nano Electro Mechanical Systems Award

08:35 **IEEE Electron Devices Society Robert Bosch Micro and Nano Electro Mechanical Systems Award Recipient**

Plenary Presentation I

08:50 **FROM ETCH TO EDGE AI: OPENING NEW HORIZONS WITH SMART SENSOR TECHNOLOGIES**
Stefan Finkbeiner
Bosch Sensortec GmbH, GERMANY

Session I - Novel MEMS/NEMS Devices for Computing/Imaging

09:35 **SUB-300 MILLIVOLT OPERATION IN NONVOLATILE 300 NM X 100 NM PHASE CHANGE NANOELECTROMECHANICAL SWITCH**
Mohammad Ayaz Masud and Gianluca Piazza
Carnegie Mellon University, USA

09:50 **A FAST AND ENERGY-EFFICIENT NANOELECTROMECHANICAL NON-VOLATILE MEMORY FOR IN-MEMORY COMPUTING**
Yong-Bok Lee[1], Min-Ho Gang[2], Pan-Kyu Choi[1], Su-Hyun Kim[1],
Tae-Soo Kim[1], So-Young Lee[1] and Jun-Bo Yoon[1]
[1]Korea Advanced Institute of Science and Technology (KAIST), KOREA and
[2]National NanoFab Center (NNFC), KOREA

10:05 **TOWARDS ULTRA-HIGH SPATIAL RESOLUTION SENSING OF GHZ ULTRASOUND USING STRAIN MODULATION OF FIELD EFFECT TRANSISTORS**
Rohan Sanghvi[1], Justin Kuo[2], Adarsh Ravi[1], and Amit Lal[1]
[1]Cornell University, USA and [2]Geegah Inc., USA

10:20 **A TACTILE SENSOR ARRAY WITH A MONOLITHICALLY INTEGRATED NEURAL NETWORK FOR EDGE COMPUTATION**
Tengteng Lei, Yushen Hu, and Man Wong
Hong Kong University of Science and Technology, HONG KONG

10:35 **Break & Exhibit Inspection**

Session II - BioMEMS I

11:05 **EVALUATION OF LOCAL AND INTERNAL ELASTICITY OF HYDROGEL MATERIALS BY USING LIGHT-DRIVEN GEL ACTUATOR**
Hibiki Nakajima[1], Yuha Koike[1], Yoshiyuki Yokoyama[2], Masaya Hagiwara[3], and Takeshi Hayakawa[1]
[1]Chuo University, JAPAN, [2]Toyama Industrial Technology Research and Development Center, JAPAN, and [3]RIKEN, JAPAN

11:20 **3D PRINTED MINIATURIZED SOFT MICROSWIMMER FOR MULTIMODAL 3D AIR-LIQUID NAVIGATION AND MANIPULATION**
Dominique Decanini[1], Abdelmounaim Harouri[1], Ayako Mizushima[2],
Beomjoon Kim[2], Yoshio Mita[2], and Gilgueng Hwang[1,2]
[1]Paris-Saclay University, FRANCE and [2]University of Tokyo, JAPAN

11:35 **SELF-DRIVEN CAPILLARIC VISCOMETER FOR DIRECT OR CASCADED BAR GRAPH READ-OUT OF RELATIVE SAMPLE VISCOSITY**
Daniel Mak[1], R. Claude Meffan[1,2], Julian Menges[1], Fabian Dolamore[1],
Conan Fee[1], Renwick C.J. Dobson[1], and Volker Nock[1]
[1]University of Canterbury, NEW ZEALAND and [2]Kyoto University, JAPAN

11:50 **A FLEXIBLE BIOSENSING PLATFORM FOR HIGH-THROUGHPUT MEASUREMENT OF CARDIOMYOCYTE CONTRACTILITY**
Wenkun Dou[1], Jason Maynes[2], and Yu Sun[1]
[1]University of Toronto, CANADA and [2]Hospital for Sick Children, CANADA

12:05 **FLEXIBLE BI-DIRECTIONAL BRAIN COMPUTER INTERFACE FOR CONTROLLING TURNING BEHAVIOR OF MICE**
Yifei Ye[1], Ye Tian[1,2], Han Wang[1], Qian Cheng[1], Kuikui Zhang[1], Xueying Wang[1,2], Cunkai Zhou[1],
Chengjian Xu[1], Xiaoling Wei[1,2], Zhitao Zhou[1,2], Tiger H. Tao[1,2,3,4,5,6], and Liuyang Sun[1,2]
[1]Chinese Academy of Sciences, CHINA, [2]University of Chinese Academy of Sciences, CHINA, [3]ShanghaiTech University, 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

12:20 **Lunch & Exhibit Inspection**

Session III - MEMS Inertial Sensors and Power MEMS

13:45 **HIGH SENSITIVITY MEMS Z-AXIS ACCELEROMETER WITH IN-PLANE DIFFERENTIAL READOUT**
Valentina Zega[1], Gabriele Gattere[2], Manuel Riani[2], Francesco Rizzini[2], and Attilio Frangi[1]
[1]Politecnico di Milano, ITALY and [2]STMicroelectronics, ITALY

14:00 **TWO-AXIS ELECTROMAGNETIC SCANNER INTEGRATED WITH AN ELECTROSTATIC XY-STAGE POSITIONER**
Yuki Okamoto, Hironao Okada, and Masaaki Ichiki
National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

14:15 **MEMS SHOCK ABSORBERS INTEGRATED WITH AL_2O_3-REINFORCED, MECHANICALLY RESILIENT NANOTUBE ARRAYS**
Hojoon Lee[1], Eunhwan Jo[1], Jae-Ik Lee[2], and Jongbaeg Kim[1]
[1]Yonsei University, KOREA and [2]Harvard Medical School, USA

14:40 **HIGH-INDUCTANCE-DENSITY MEMS 3D-SOLENOID TRANSFORMERS WITH INSERTED THIN-FILM FERRITE MAGNETIC CORE FOR ON-CHIP INTEGRATED DC-DC POWER CONVERSIONS**
Changnan Chen[1,2], Pichao Pan[1,2], Jiebin Gu[1,2], and Xinxin Li[1,2]
[1]Chinese Academy of Sciences, CHINA and [2]University of Chinese Academy of Sciences, CHINA

Poster/Oral Session I

14:45 **Poster/Oral Session I**
Poster presentations are listed by topic category with their assigned number starting on Page 14.

16:15 **Break & Exhibit Inspection**

MEMS Community Announcement

16:45 Clark T.-C. Nguyen, *University of California, Berkeley, USA*

Session IV - BioMEMS II

16:50 **MICRON-SIZED PARYLENE-IN-OIL WATER PROTECTION LAYER**
Kuang-Ming Shang[1], Haixu Shen[1], Ningxuan Dai[1], David Kong[1,2], Tzung Hsiai[3], and Yu-Chong Tai[1]
[1]California Institute of Technology, USA, [2]Harvard University, USA, and
[3]University of California, Los Angeles, USA

17:05 **A PIPETTE TIP INTEGRATED WITH A CAPACITIVE MICROSENSOR FABRICATED BY COMBINED 3D PRINTING AND MEMS PROCESS FOR CELL DETECTION AND TRANSPORTATION**
Satoshi Amaya, Hirotaka Sugiura, Bilal Turan, Shingo Kaneko, and Fumihito Arai
University of Tokyo, JAPAN

17:20 **FOLDABLE POLYMER STENT INTEGRATED WITH WIRELESS PRESSURE SENSOR FOR BLOOD PRESSURE MONITORING**
Nomin-Erdene Oyunbaatar and Dong-Weon Lee
Chonnam National University, KOREA

17:35 **A DYNAMIC MICROARRAY DEVICE FOR SELECTIVE PAIRING AND ELECTROFUSION OF LIPOSOMES**

Sho Takamori[1], Hisatoshi Mimura[1], Toshihisa Osaki[1], and Shoji Takeuchi[1,2]
[1]Kanagawa Institute of Industrial Science and Technology, JAPAN and [2]University of Tokyo, JAPAN

17:50 **REAL-TIME FUNCTIONAL BRAIN MAPPING BASED ON HIGH-CHANNEL-COUNT, ULTRA-CONFORMAL NEURAL INTERFACE**

Xiner Wang[1,2], Zhaohan Chen[3], Jizhi Liang[1,2], Xiaoling Wei[1,2], Liuyang Sun[1,2], Meng Li[1,2],
Zhitao Zhou[1,2], and Tiger H. Tao[1,2,4,5,6]
[1]Chinese Academy of Sciences, CHINA, [2]University of Chinese Academy of Science, CHINA,
[3]Shanghai Normal University, 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

18:05 **Adjourn for the day**

Tuesday, 17 January

All times are Central European Time (CET).

Plenary Presentation II

08:30 **ACOUSTOFLUIDICS: MERGING ACOUSTICS AND FLUID MECHANICS FOR BIOMEDICAL APPLICATIONS**
Tony Jun Huang
Duke University, USA

Session V - New Materials, Fabrication, and Packaging

09:15 **SILICON CARBIDE REINFORCED VERTICALLY ALIGNED CARBON NANOTUBE COMPOSITE FOR HARSH ENVIRONMENT MEMS**
Jiarui Mo, Shreyas Shankar, Guoqi Zhang, and Sten Vollebregt
Delft University of Techonology, NETHERLANDS

09:30 **A RELIABLE RELEASE METHOD FOR A BACK-END-OF-LINE NEMS SWITCH OF A MONOLITHIC THREE-DIMENSIONAL INTEGRATED CMOS-NEMS CIRCUIT**
Tae-Soo Kim, Yong-Bok Lee, So-Young Lee, Seung-Jun Lee, and Jun-Bo Yoon
Korea Advanced Institute of Science and Technology (KAIST), KOREA

09:45 **INCREASE OF EXPANSION RATE AND DIRECTION CONTROL OF MICROGEL ACTUATORS FOR SINGLE CELL MANIPULATIONS**
Kyoka Nakano[1], Hiroki Wada[1], Yoshiyuki Yokoyama[2], and Takeshi Hayakawa[1]
[1]Chuo University, JAPAN and [2]Toyama Industrial Technology Research and Development Center, JAPAN

10:00 **GENERALIZED-ACCUMULATED-TEMPERATURE PARAMETER FOR CHARACTERISTIC PREDICTION OF METAL-BASED MEMS CANTILEVER**
Yulong Zhang[1], Jianwen Sun[1], Huiliang Liu[2], and Zewen Liu[1]
[1]Tsinghua University, CHINA and [2]China Academy of Space Technology, CHINA

10:15 **Break and Exhibit Inspection**

Session VI - Micro- and Nanofluidics and Medical Applications

10:45 **MEMS-BASED WATER COLLECTION CONDENSATION PARTICLE COUNTER (WCCPC) OPTIMIZED FOR MULTI-POINT MONITORING OF AIRBORNE NANOPARTICLES**
Seong-Jae Yoo and Yong-Jun Kim
Yonsei University, KOREA

11:00 **RECONSTITUTING FUNDAMENTALS OF BACTERIA MEDIATED CANCER THERAPY ON A CHIP**
Wonjun Lee[1], Jiin Park[2], Dongil Kang[3], and Seungbeum Suh[4]
[1]Seoul National University, KOREA, [2]Ewha Womans University, KOREA, [3]Hanyang University, KOREA, and [4]Korea Institute of Science and Technology (KIST), KOREA

11:15 **3D SPATIAL FOCAL CONTROL BY ARRAYED OPTOFLUIDIC PRISMS**
Cheng-Hsun Lee, Yeonwoo Lee, and Sung-Yong Park
San Diego State University, USA

11:30 **HIGH-SPEED AND PINPOINT LIQUID EXCHANGE ON MICROFLUIDIC CHIP USING 3D PRINTED DOUBLE-BARRELED MICROPROBE WITH DUAL PUMPS**
Xu Du[1], Shingo Kaneko[2], Hisataka Maruyama[1], Hirotaka Sugiura[2], and Fumihito Arai[1,2]
[1]Nagoya University, JAPAN and [2]University of Tokyo, JAPAN

11:45 **DESIGN OF A DNA SYNTHESIS CHIP FOR DATA STORAGE WITH ULTRA-HIGH THROUGHPUT AND DENSITY FEATURING LARGE-SCALE INTEGRATED CIRCUITS AND MICROFLUIDIC CONFINEMENT**
Ning Wang[1,2,3], Shijia Yang[1,3], Dayin Wang[1,2,3], Zhen Cao[4], Yuan Luo[1,3], and Jianlong Zhao[1,3]
[1]Chinese Academy of Sciences, CHINA, [2]ShanghaiTech University, CHINA,
[3]University of Chinese Academy of Sciences, CHINA, and [4]Zhejiang University, CHINA

MEMS 2024 Announcement

16:45 **MEMS 2024 Conference Chairs**
Wen Li, *Michigan State University, USA*
Dana Weinstein, *Purdue University, USA*

12:15 **Lunch & Exhibit Inspection**

Session VII - MEMS Fluidic Sensors

13:15 **A REAL-TIME WIRELESS CALORIMETRIC FLOW SENSOR SYSTEM WITH A WIDE LINEAR RANGE FOR LOW-COST RESPIRATORY MONITORING**
Lifeng Huang[1], Izhar[2,4], Xiaoyong Zhou[3], Mingdong Fang[3], Siwei Huang[1],
Yi-Kuen Lee[2], Xiaofang Pan[1], and Wei Xu[1] [1]
[1]Shenzhen University, CHINA, [2]Hong Kong University of Science and Technology, CHINA,
[3]Mindray Medical International Limited, CHINA, and [4]University of Pennsylvania, USA

13:30 **ADVANCED THERMOPHYSICAL PROPERTIES MEASUREMENTS USING HEATER-INTEGRATED FLUIDIC RESONATORS**
Juhee Ko, Bong Jae Lee, and Jungchul Lee
Korea Advanced Institute of Science and Technology (KAIST), KOREA

13:45 **A MINIATURIZED TRANSIT-TIME ULTRASONIC FLOWMETER USING PMUTS FOR LOW-FLOW MEASUREMENT IN SMALL-DIAMETER CHANNELS**
Yunfei Gao[1,2], Zhipeng Wu[2], Minkan Chen[2], and Liang Lou[1,2]
[1]Shanghai University, CHINA and [2]Shanghai Industrial μ Technology Research Institute, CHINA

14:00 **MEMS DIFFERENTIAL THERMOPILES FOR HIGHLY-SENSITIVE HYDROGEN GAS DETECTION**
Haozhi Zhang[1,2], Hao Jia[1,2], Ming Li[1,2], Pengcheng Xu[1,2], and Xinxin Li[1,2]
[1]Chinese Academy of Sciences, CHINA and [2]University of Chinese Academy of Sciences, CHINA

Poster/Oral Session II

14:15 **Poster/Oral Session II**
Poster presentations are listed by topic category with their assigned number starting on Page 14.

15:45 **Break & Exhibit Inspection**

Session VIII - Sonics & Ultrasonics MEMS

16:15 **DOMAIN/BOUNDARY VARIATION IN CANTILEVER ARRAY FOR BANDWIDTH ENHANCEMENT OF PZT MEMS MICROSPEAKER**
Shu-Wei Chang[1], Ting-Chou Wei[1], Sung-Cheng Lo[2], and Weileun Fang[1]
[1]National Tsing Hua University, TAIWAN and [2]Transducer Star Technology Inc., TAIWAN

16:30 **ON THE DESIGN OF PIEZOELECTRIC MEMS MICROSPEAKER WITH HIGH FIDELITY AND WIDE BANDWIDTH**
Ting-Chou Wei, Zih-Song Hu, Shu-Wei Chang, and Weileun Fang
National Tsing Hua University, TAIWAN

16:45 **HIGH-PERFORMANCE WAFER-SCALE TRANSFER-FREE GRAPHENE MICROPHONES**
Roberto Pezone, Gabriele Baglioni, Pasqualina M. Sarro, Peter G. Steeneken, and Sten Vollebregt
Delft University of Technology, NETHERLANDS

17:00 **HIGH-SPL AND LOW-DRIVING-VOLTAGE PMUTS BY SPUTTERED POTASSIUM SODIUM NIOBATE**
Fan Xia[1,2], Yande Peng[1,2], Sedat Pala[1,2], Ryuichi Arakawa[1,3], Wei Yue[1,2], Pei-Chi Tsao[2], Chun-Ming Chen[2], Hanxiao Liu[1,2], Megan Teng[2], Jong Ha Park[1,2], and Liwei Lin[1,2]
[1]Berkeley Sensor and Actuator Center, USA, [2]University of California, Berkeley, USA, and [3]NGK Spark Plug Co., JAPAN

17:15 **EPITAXIAL $P_B(Z_R,T_I)O_3$-BASED PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCER FABRICATED ON SILICON-ON-NOTHING (SON) STRUCTURE**
Takuma Sekiguchi[1], Shinya Yoshida[2], Yoshiaki Kanamori[1], and Shuji Tanaka[1]
[1]Tohoku University, JAPAN and [2]Shibaura Institute of Technology, JAPAN

17:30 **Adjourn for the day**

19:00 - 22:00 **Banquet at the Löwenbräu Keller**

MEMS 2022 welcomes you to the historic Löwenbräu Keller. Join us for a memorable evening of networking with colleagues in a traditional German beer hall.

This event is included in your registration. Guest tickets may be purchased. Transportation is not included, but the U-Bahn stop is a 1-minute walk to the event.

Wednesday, 18 January

All times are Central European Time (CET).

Plenary Presentation III

08:30 **LEVERAGING SEMICONDUCTOR ECOSYSTEMS TO MEMS**
Weileun Fang, Sheng-Shian Li, and Ming-Huang Li
National Tsing Hua University, TAIWAN

Session IX - Optomechanics & Photonics Integration

09:15 **PROGRAMMABLE SILICON NITRIDE PHOTONIC INTEGRATED CIRCUITS**
Hao Tian[1], Alaina G. Attanasio[1], Anat Siddharth[2], Andrey Voloshin[2], Viacheslav Snigirev[2], Grigory Lihachev[2], Andrea Bancora[2], Vladimir Shadymov[2], Rui N. Wang[2], Johann Riemensberger[2], Tobias J. Kippenberg[2], and Sunil A. Bhave[1]
[1]Purdue University, USA and [2]Swiss Federal Institute of Technology Lausanne (EPFL), SWITZERLAND

09:30 **MULTIFREQUENCY NANOMECHANICAL MASS SPECTROMETER PROTOTYPE FOR MEASURING VIRAL PARTICLES USING OPTOMECHANICAL DISK RESONATORS**
Oscar Malvar[1], Eduardo Gil-Santos[1], Jose J. Ruz[1], Elena Sentre-Arribas[1], Adrián Sanz-Jiménez[1], Priscila M. Kosaka[1], Sergio García-López[1], Álvaro San Paulo[1], Samantha Sbarra[2], Louis Waquier[2], Ivan Favero[2], Maurits van der Heiden[3], Robert K. Altmann[3], Dimitris Papanastasiou[4], Diamantis Kounadis[4], Ilias Panagiotopoulos[4], Jesús Mingorance[5], María Rodríguez-Tejedor[5], Rafael Delgado[6], Montserrat Calleja[1], and Javier Tamayo[1]
[1]Instituto de Micro y Nanotechnologis, IMN-CSIC, CSIC (CEI UAM+CSIC), SPAIN, [2]Université Paris Cité, FRANCE, [3]The Netherland Organization for Applied Scientific Research (TNO), NETHERLANDS, [4]Fasmatech Science and Technology, GREECE, [5]Hospital Universitario La Paz, SPAIN, and [6]Hospital Universitario 12 de Octubre, SPAIN

09:45 **A MICROFABRICATED DIAMOND QUANTUM MAGNETOMETER WITH PICOTESLA SCALE SENSITIVITY**
Fei Xie[1,2], Qihui Liu[1,2], Yuqiang Hu[3,4], Lingyun Li[1,2], Zhichao Chen[1,2], Jin Zhang[1], Yonggui Zhang[1,2], Yuyao Zhang[3,4], Yang Wang[1,2], Jiangong Cheng[1,2], Hao Chen[1,2], and Zhenyu Wu[1,2,3,4]
[1]Chinese Academy of Sciences, CHINA, [2]University of Chinese Academy of Sciences, CHINA, [3]Shanghai University, CHINA, and [4]Shanghai Industrial μTechnology Research Institute, CHINA

10:00 **Break & Exhibit Inspection**

Session X - RF MEMS Filters & Resonators (5G & 6G)

10:30 **A NON-VOLATILE THRESHOLD SENSING SYSTEM USING A FERROELECTRIC $HF_{0.5}ZR_{0.5}O_2$ DEVICE AND A $L_iN_bO_3$ MICROACOUSTIC RESONATOR**
Onurcan Kaya, Luca Colombo, Benyamin Davaji, and Cristian Cassella
Northeastern University, USA

10:45 **RESONANT CONFINERS FOR ACOUSTIC LOSS MITIGATION IN BULK ACOUSTIC WAVE RESONATORS**
Jeronimo Segovia-Fernandez and Ernest T.-T. Yen
Texas Instruments, Kilby Labs, USA

11:00 **HIGH-CRYSTALLINITY 30% SCALN ENABLING HIGH FIGURE OF MERIT X-BAND MICROACOUSTIC RESONATORS FOR MID-BAND 6G**
Gabriel Giribaldi, Pietro Simeoni, Luca Colombo, and Matteo Rinaldi
Northeastern University, USA

11:15 **FERRITE-ROD ANTENNA DRIVEN WIRELESS RESOSWITCH RECEIVER**
Kevin H. Zheng, Qiutong Jin, and Clark T.-C. Nguyen
University of California, Berkeley, USA

11:30 **ULTRA-WIDEBAND MEMS FILTERS USING LOCALIZED THINNED 128° Y-CUT THIN-FILM LITHIUM NIOBATE**
Jinbo Wu[1,2,3], Shibin Zhang[1], Pengcheng Zheng[1,2], Liping Zhang[1,2], Hulin Yao[1,2], Xiaoli Fang[1,2], Xuedi Tian[1,2], Xiaomeng Zhao[1], Tao Wu[3], and Xin Ou[1,2]
[1]Shanghai Institute of Microsystem and Information Technology, CHINA, [2]University of Chinese Academy of Sciences, CHINA, and [3]ShanghaiTech University, CHINA

11:45 **Lunch & Exhibit Inspection**

Session XIa - MEMS/NEMS Resonators & Non-Linear Dynamics

13:00 **ATTRACTOR EXCHANGER FOR OPEN-LOOP OPERATION OF MICROMECHANICAL NONLINEAR RESONATORS USING GAP-SPACING CONTINUATION**
Chun-Pu Tsai and Wei-Chang Li
National Taiwan University, TAIWAN

13:15 **A CMOS-MEMS ULTRASENSITIVE THERMOMETER USING INTERNAL RESONANCE INDUCED FREQUENCY COMBS**
Ting-Yi Chen, Chun-Pu Tsai, and Wei-Chang Li
National Taiwan University, TAIWAN

13:30 **ATOMICALLY THIN NEMS FREQUENCY COMB WITH BOTH FREQUENCY TUNABILITY AND RECONFIGURABLE VIA SIMULTANEOUS 1:2 AND 1:3 MODE COUPLING**
Bo Xu, Jiankai Zhu, Chenyin Jiao, Jianglong Chen, and Zenghui Wang
University of Electronic Science and Technology of China, CHINA

13:45 **INSTRUMENTAL ANALYSIS OF ADVANCED CATALYSTS BASED ON RESONANT MICROCANTILEVERS**
Xinyu Li[1,2], Pengcheng Xu[1,2], Ying Chen[1], Haitao Yu[1], and Xinxin Li[1,2]
[1]Chinese Academy of Sciences, CHINA and [2]University of Chinese Academy of Sciences, CHINA

Session XIb - BioSensors I

13:00 **A MULTIPLEXED BIOAFFINITY BIOSENSING PATCH FOR POINT-OF-CARE CHRONIC ULCER MONITORING**
Md Sharifuzzaman, Dongkyun Kim, Md Selim Reza, SeongHoon Jeong, Hye Su Song, Md Abu Zahed, and Jae Yeong Park
Kwangwoon University, KOREA

13:15 **3-DOF BIOHYBRID ACTUATOR WITH MULTIPLE SKELETAL MUSCLE TISSUES**
Xinzhu Ren, Yuya Morimoto, and Shoji Takeuchi
University of Tokyo, JAPAN

13:30 **A LOW NOISE MICROELECTRODE ARRAY FOR SPECIFIC CELL ACTIVITY MODULATION FROM CELL TO TISSUE**
Bohan Zhang[1,2], Huiran Yang[2], Xiner Wang[2,3], Ziyi Zhu[2,3], Zongxing He[1], Wanqi Jiang[2,3], Chen Tao[1,2], Dujuan Zou[2,3], Meng Li[2,3], Zhitao Zhou[2,3], Liuyang Sun[2,3], Tiger H. Tao[1,2,3,4,5,6], and Xiaoling Wei[2,3]
[1]ShanghaiTech University, CHINA, [2]Chinese Academy of Sciences, CHINA, [3]University of Chinese Academy of Sciences, 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

13:45 **BIONIC MECHANICAL HAND INTEGRATED WITH ARTIFICIAL OLFACTORY SENSOR ARRAY FOR ENHANCED OBJECT RECOGNITION**
Jiachuang Wang[1,2], Xiaohui Li[1,2], MengWei Liu[1,2], Pingping Zhang[3], Tiger H. Tao[1,2,4], and Nan Qin[1,2]
[1]Chinese Academy of Sciences, CHINA, [2]University of Chinese Academy of Sciences, CHINA, [3]Suzhou Huiwen Nanotechnology Co., Ltd., CHINA, and [4]Neuroxess Co., Ltd. (Jiangxi), CHINA

Poster/Oral Session III

14:00 **Poster/Oral Session III**
Poster presentations are listed by topic category with their assigned number starting on Page 14.

15:30 **Break & Exhibit Inspection**

Session XIIa - Force & Displacement/ Tactile Sensors & Human-Machine

16:00 **HIGH RESOLUTION TACTILE SENSOR FOR MEASUREMENT OF A COMPLICATED TACTILE FEELING OF "*SHITTORI*" WITH MOISTNESS**
Genki Yamada, Yuto Morita, Kyohei Terao, Fusao Shimokawa, and Hidekuni Takao
Kagawa University, JAPAN

16:15 **PYRAMIDAL STRUCTURED MXENE/ECOFLEX COMPOSITE-BASED TOROIDAL TRIBOELECTRIC SELF-POWERED SENSOR FOR HUMAN-MACHINE INTERFACE**
Shipeng Zhang, Sm Sohel Rana, Gagan Bahad Pradhan, Trilochan Bhatta, Seonghoon Jeong, and Jae Yeong Park
Kangwoon University, KOREA

16:30 **LIG-BASED TRIAXIAL TACTILE SENSOR UTILIZING ROTATIONAL ERECTION SYSTEM**
Rihachiro Nakashima[1], Nagi Nakamura[2], Tomohiko G. Sano[1], Eiji Iwase[2], and Hidetoshi Takahashi[1]
[1]Keio University, JAPAN and [2]Waseda University, JAPAN

16:45 **A STRETCHABLE STRAIN-INSENSITIVE SMART GLOVE FOR SIMULTANEOUS DETECTION OF PRESSURE AND TEMPERATURE**
Sudeep Sharma, Gagan Bahadur Pradhan, Seonghoon Jeong, and Jae Yeong Park
Kwangwoon University, KOREA

17:00 **A GESTURE RECOGNITION GLOVE ASSEMBLED WITH NANOFOREST-INTEGRATED INFRARED THERMOPILES**
Mao Li[1,2], Meng Shi[1,2], Guidong Chen[1,2], Na Zhou[1,2], Haiyang Mao[1,2], and Chengjun Huang[1,2]
[1]Chinese Academy of Sciences, CHINA and [2]University of Chinese Academy of Sciences, CHINA

Session XIIb - BioSensors II

16:00 **ONE PUSH MEMBRANE FORMATION FOR ITERATIVE MEASUREMENT OF ION CHANNEL ACTIVITY ON ARRAYED CHIP**
Hisatoshi Mimura[1], Toshihisa Osaki[1,2], Sho Takamori[1], Kenji Nakao[2], and Shoji Takeuchi[1,3]
[1]Kanagawa Institute of Industrial Science and Technology (KISTEC), JAPAN, [2]Maqsys Inc., JAPAN, and [3]University of Tokyo, JAPAN

16:15 **AN IMPLANTABLE DIFFERENTIAL SENSOR WITH PASSIVE WIRELESS INTERROGATION FOR IN-SITU EARLY DETECTION OF PERIPROSTHETIC JOINT INFECTION**
Jiaxin Jiang, Cole Napier, Chandrashekhar Choudhary, H. Claude Sagi,
Chia-Ying Lin, Michael T. Archdeacon, and Tao Li
University of Cincinnati, USA

16:30 **MICROMACHINED PIEZOELECTRIC FILM-BASED FLEXIBLE ELECTRONICS WITH INTEGRATION OF FILM-SELF TEMPERATURE-DETECTING BREATH SENSOR AND ACETONE GAS SENSOR**
Hung-Yu Yeh and Guo-Hua Feng
National Tsing Hua University, TAIWAN

16:45 **FLEXIBLE TACTILE SENSING ARRAY WITH HIGH SPACIAL DENSITY BASED ON PARYLENE MEMS TECHNIQUE**
Meixuan Zhang[1], Zetian Wang[1], Han Xu[2], Lang Chen[1], Yufeng Jin[2,3], and Wei Wang[1,3,4]
[1]Peking University, CHINA, [2]Peking University Shenzhen Graduate School, CHINA,
[3]National Key Lab of Micro/Nano Fabrication Technology, CHINA, and
[4]Beijing Advanced Innovation Center for Integrated Circuits, CHINA

17:00 **SILK-ENABLED FOLDABLE AND CONFORMAL NEURAL INTERFACE WITH IN-PLANE SHIELDING FOR HIGH-QUALITY ELECTROPHYSIOLOGICAL RECORDINGS**
Jizhi Liang[1,2], Zhaohan Chen[1,3], Xiner Wang[1,2], Feihong Xu[1,2], Xiaoling Wei[1,2], Liuyang Sun[1,2], Meng Li[1,2,] Tiger H. Tao[1,2,4,5,6,7], and Zhitao Zhou[1,2]
[1]Chinese Academy of Sciences, CHINA, [2]University of Chinese Academy of Sciences, CHINA,
[3]Shanghai Normal 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

17:15 **Adjourn for the day**

Thursday, 19 January

All times are Central European Time (CET).

Plenary Presentation IV

08:30 **MATERIALS ENGINEERING FOR CHEMICAL SENSING ENHANCEMENT**
Navpreet Kaur, Dario Zappa, and Elisabetta Comini
University of Brescia, ITALY

Session XIII - Gas & Flow Sensors

09:15 **ON-DEMAND PREPARATION OF GAS-SENSING MATERIALS GUIDED BY RESONANT CANTILEVER-BASED THERMOGRAVIMETRIC ANALYSIS**
Yufan Zhou[1,2], Ming Li[1,2], Ying Chen[1,2], Xinyu Li[1,2], Pengcheng Xu[1,2], and Xinyu Li[1,2]
[1]Chinese Academy of Sciences, CHINA and [2]University of Chinese Academy of Sciences, CHINA

09:30 **AN INTELLIGENT GAS ANALYSIS SYSTEM CONSISTING OF SENSORS AND A NEURAL NETWORK IMPLEMENTED USING THIN-FILM TRANSISTORS**
Zong Liu[1,2], Yushen Hu[1,2], Gabriel E. Carranza[1], Fei Wang[2], and Man Wong[1]
[1]Hong Kong University of Science and Technology, HONG KONG and
[2]Southern University of Science and Technology, CHINA

09:45 **SINGLE-LAYER-ELECTRODE TEMPERATURE-MODULATED SNO_2 GAS SENSOR CELL WITH LOW POWER CONSUMPTION FOR DISCRIMINATION OF FOOD ODORS**
Chong Xing, Ruichen Liu, Yan Zhang, Dongcheng Xie, Yudong Wang, Yuan Huang, Muhammad Mustafa, Haochen Zhang, Zhongyu Shi, Lei Xu, and Feng Wu
University of Science and Technology of China, CHINA

10:00 **A PERFORMANCE ENHANCED THERMAL FLOW SENSOR WITH NOVEL DUAL-HEATER STRUCTURE USING CMOS COMPATIBLE FABRICATION PROCESS**
Zhongyi Liu[1], Ruoqin Wang[2], Gai Yang[1], Xinyuan Zhang[1], Rui Jiao[2], Xuejiao Li[1], Jiali Qi[3], Hongyu Yu[2], Huikai Xie[1,4], and Xiaoyi Wang[1,4]
[1]Beijing Institute of Technology, CHINA, [2]Hong Kong University of Science and Technology, HONG KONG,
[3]Hangzhou Dianzi University, CHINA, and
[4]BIT Chongqing Institute of Microelectronics and Microsystems, CHINA

Session XIV - New Fabrication Techniques

10:45 **LOCAL METAL DEPOSITION ON HYDROGELS USING MICRO-PLASMA-BUBBLES**
Haruna Takahashi, Yu Yamashita, Naotomo Tottori, Shinya Sakuma, and Yoko Yamanishi
Kyushu University, JAPAN

11:00 **FOLDING METHOD OF KIRIGAMI STRUCTURE WITH FOLDING LINES**
Nagi Nakamura and Eiji Iwase
Waseda University, JAPAN

11:15 **BUBBLE-ASSISTED RE-FORMATION OF INDIVIDUAL LIPID BILAYERS IN ARRAYED DEVICE**
Izumi Hashimoto[1,2], Toshihisa Osaki[2], Hisatoshi Mimura[2], Sho Takamori[2], Norihisa Miki[1,2], and Shoji Takeuchi[2,3]
[1]Keio University, JAPAN, [2]Kanagawa Institute of Industrial Science and Technology, JAPAN, and
[3]University of Tokyo, JAPAN

11:30 **LARGE-SCALE ARRAYS OF TUNABLE MONOLAYER MoS_2 NANOELECTROMECHANICAL RESONATORS**

Zuheng Liu[1], Luming Wang[3], Pengcheng Zhang[1], Maosong Xie[1], Yueyang Jia[1], Ying Chen[4], Hao Jia[4], Zenghui Wang[3], and Rui Yang[1,2]

[1]University of Michigan – Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University, CHINA, [2]School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, CHINA, [3]University of Electronic Science and Technology of China, CHINA, and [4]Chinese Academy of Sciences, CHINA

Awards Ceremony

11:45 **Awards Ceremony**

11:55 **Final Remarks**

12:00 **Conference Ajourns**

POSTER PRESENTATIONS

All times are Central European Time (CET).

M - Monday, 16 January - 13:45 - 15:45
T - Tuesday, 17 January - 13:30 - 15:30
W - Wednesday, 18 January - 13:30 - 15:30

Classification Chart
(last character of poster number)

a - Bio and Medical MEMS
b - Emerging Technologies and New Opportunities for MEMS/NEMS
c - Industry MEMS and Advancing MEMS for Products and Sustainability
d - Materials, Fabrication and Packaging for Generic MEMS and NEMS
e - MEMS Actuators and PowerMEMS
f - MEMS Physical and Chemical Sensors
g - Micro- and Nanofluidics
h - Optical, RF and Electromagnetics for MEMS/NEMS
i - Open Posters

a - Bio and Medical MEMS

Biosensors and Bioreactors

M101-a **ANTIFOULING FOR ELECTROCHEMICALLY BIOSENSING IN BODY FLUIDS**
Wenzheng He[1], Changdong Zhou[2], Yang Lin[2], Yuxin Tian[2], Liying Liu[2], Qifu Zhang[2], Xiongying Ye[1], and Tianhong Cui[3]
[1]Tsinghua University, CHINA, [2]Jilin Cancer Hospital, CHINA, and [3]University of Minnesota, USA

T201-a **ELECTRO-MAGNETIC SENSOR MEDIATED BY MAGNETIC BIOMOLECULES**
Qian Cheng[1,2], Yuqing Ge[1], Hongju Mao[1,2], Lin Zhou[1], and Jianlong Zhao[1,2]
[1]Chinese Academy of Science, CHINA and [2]University of Chinese Academy of Sciences, CHINA

W301-a **GAS-FLOW DEVICE FOR EFFECTIVE DISSOLUTION OF GAS-PHASE ODORANTS UTILIZED FOR BIOHYBRID SENSORS**
Takuma Nakane[1,2], Toshihisa Osaki[2], Hisatoshi Mimura[2], Sho Takamori[2], Norihisa Miki[1,2], and Shoji Takeuchi[2,3]
[1]Keio University, JAPAN, [2]Kanagawa Institute of Industrial Science and Technology, JAPAN, and [3]University of Tokyo, JAPAN

M102-a **MULTIPLE WELLS ON A CMOS-MEA FOR CELL-BASED BIOHYBRID ODORANT SENSORS**
Yujia Lian, Haruka Oda, Minghao Nie, and Shoji Takeuchi
University of Tokyo, JAPAN

T202-a **THE INTEGRATED RGO/PEDOT: PSS-MODIFIED ULTRAFLEXIBLE MICROELECTRODES TOWARDS LONG-TERM NEUROPHYSIOLOGICAL SIGNALING AND DOPAMINE SENSITIVE DETECTION**
Xueying Wang[1,2], Huiran Yang[1], Bohan Zhang[1,3], Meng Li[1,2], Liuyang Sun[1,2], Zhitao Zhou[1,2], Tiger H. Tao[1,2,3,4,5,6], and Xiaoling Wei[1,2]
[1]Chinese Academy of Sciences, CHINA, [2]University of Chinese Academy of Sciences, CHINA, [3]Shanghai Tech University, 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

a - Bio and Medical MEMS
Devices & Systems for Cellular and Molecular Studies

W302-a **COMPARISON OF SELECTIVE FILTRATION OF ON-CHIP GLOMERULUS COMPRISED OF ORGANOID-DERIVED AND IMMORTALIZED PODOCYTES**
Ayumu Tabuchi[1], Kensuke Yabuuchi[2,3], Yoshiki Sahara[2], Minoru Takasato[2,4], Kazuya Fujimoto[1], and Ryuji Yokokawa[1]
[1]Kyoto university, JAPAN, [2]RIKEN, JAPAN, and [3]Osaka University, JAPAN

M103-a **CONTROLLING FIRING POINT OF MICROFIBER-SHAPED HIPSC-DERIVED CARDIAC TISSUE WITH LOCALIZED ELECTRICAL STIMULATION DEVICE**
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

T203-a **DEVELOPMENTAL PHASES OF ON-CHIP VASCULOGENESIS CLASSIFIED USING A DEEP LEARNING VISUAL MODEL**
Taiga Irisa, Hang Zhou, Kazuya Fujimoto, and Ryuji Yokokawa
Kyoto University, JAPAN

W303-a **HAND-DRIVEN DEVICE FOR PREPARATION OF LINEARLY ALIGNED HYDROGEL SHEETS**
Aoi Kato[1,2], Haruka Oda[3], Sho Takamori[2], Hisatoshi Mimura[2], Toshihisa Osaki[2], Norihisa Miki[1,2], and Shoji Takeuchi[2,3]
[1]Keio University, JAPAN, [2]Kanagawa Institute of Industrial Science and Technology, JAPAN, and [3]University of Tokyo, JAPAN

M104-a **MICROFABRICATION AND CHARACTERIZATION OF MICRO-STEREOLITHOGRAPHICALLY 3D PRINTED, AND DOUBLE METALLIZED BIOPLATES WITH 3D MICROELECTRODE ARRAYS FOR *IN-VITRO* ANALYSIS OF CARDIAC ORGANOIDS**
Jorge Manrique Castro, Isaac Johnson, and Swaminathan Rajaraman
University of Central Florida, USA

T204-a **OIL-SEALED RGD-MODIFIED HYDROGEL MICROWELL ARRAY WITH SIZE- SELECTIVE PERMEATION FOR ANALYSIS ON EXOSOMES FROM SINGLE CELLS**
Chisaki Yamagata[1], Shun Itai[1], Yuta Kurashina[2], Makoto Asai[1], Ayuko Hoshino[3], and Hiroaki Onoe[1]
[1]Keio University, JAPAN, [2]Tokyo University of Agriculture and Technology, JAPAN, and [3]Tokyo Institute of Technology, JAPAN

W304-a **PICKING SINGEL CELLS FROM 10 ML SAMPLE BASED ON A MICROFILTRATION- LIFT COMBINATION PLATFORM**
Qingmei Xu[1,2], Yuntong Wang[2,3], Xiao Ma[4], Hang Li[5], Ying Xue[5], Yi Zhang[1], Songtao Dou[1], Huan Wang[2], Bei Li[2,5], and Wei Wang[1,6,7]
[1]Peking University, CHINA, [2]Chinese Academy of Sciences, CHINA, [3]University of Chinese Academy of Sciences, CHINA, [4]Hangzhou Branemagic Medical Technology Co. Ltd., CHINA, [5]Hooke Laboratory, CHINA, [6]National Key Lab of Micro/Nano Fabrication Technology, CHINA, and [7]Beijing Advanced Innovation Center for Integrated Circuits, Beijing, CHINA

a - Bio and Medical MEMS
Flexible and Wearable Devices and Systems

M105-a **A TRANSFER METHOD FOR EMBEDDING CONDUCTIVE FILLERS ON THE SURFACE OF MULTI-SCALE STRUCTURES FOR 3D FLEXIBLE CONDUCTORS**
Dongwoo Yoo, Sangmok Kim, Jeonghyeon Hwang, and Joonwon Kim
Pohang University of Science and Technology (POSTECH), KOREA

T205-a **FABRICATION OF HIGH FREQUENCY 2D FLEXIBLE PMUT ARRAY**
Sanjog V. Joshi, Sina Sadeghpour, and Michael Kraft
KU Leuven, BELGIUM

W305-a **FLEXIBLE SILK-BASED GRAPHENE BIOELECTRONICS FOR WEARABLE MULTIMODAL PHYSIOLOGICAL MONITORING**
Sajjad Mirbakht[1], Ata Golparvar[1,2], Muhammad Umar[1], and Murat Kaya Yapici[1,3]
[1]Sabanci University, TURKEY, [2]École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND, and [3]University of Washington, USA

M106-a **HIGHLY ACCURATE MEASUREMENT OF CONTACT RESISTANCE BETWEEN GALINSTAN AND COPPER USING TRANSFER LENGTH METHOD**
Takashi Sato and Eiji Iwase
Waseda University, JAPAN

T206-a **MACHINE LEARNING ENABLED HIND FOOT DEFORMITY DETECTION USING INDIVIDUALLY ADDRESSABLE HYBRID PRESSURE SENSOR MATRIX**
Nadeem Tariq Beigh, Faizan Beigh, Sourav Naval, Dibyajyoti Mukherjee, and Dhiman Mallick
Indian Institute of Technology, Delhi, INDIA

W306-a **MULTI-MODE E-SKIN INTEGRATING CAPACITIVE-PIEZOELECTRIC SENSORS FOR STATIC-DYNAMIC MECHANORESPONSE WITH WIDE SENSING RANGE**
Mujeeb Yousuf[1], Sushil Kumar[1], Dhairya Singh Arya[2], Manu Garg[1], Khanjhan Joshi[1], and Pushpapraj Singh[1]
[1]Indian Institute of Technology, Delhi, INDIA and
[2]CSIR-Central Scientific Instruments Organisation (CSIO), INDIA

M107-a **NON-INVASIVE INSTANT MEASUREMENT OF ARTERIAL STIFFNESS 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, CHINA and [2]University of Chinese Academy of Sciences, CHINA

T207-a **SUPPRESSION OF BIOELECTRICAL NOISE SIGNALS IN MOTION STATE BY LOW-COST MICROPILLAR HYDROGEL ELECTRODE**
Gencai Shen, Nan Zhao, Chunpeng Jiang, Zhuangzhuang Wang, and Jingquan Liu
Shanghai Jiao Tong University, CHINA

W307-a **ULTRA-THIN MEMS PACKAGING BASED ON AUXETIC STRETCHABLE STRUCTURES FOR APPLICATIONS IN WEARABLE ELECTRONICS**
Daniel Zymelka, Toshihiro Takeshita, Yusuke Takei, and Takeshi Kobayashi
National Institute of Advanced Industrial Science and Technology, JAPAN

M108-a **ULTRALOW POWER FLEXIBLE OCULAR MICROSYSTEM FOR VERGENCE AND DISTANCE SENSING BASED ON PASSIVE DIFFERENTIAL MAGNETOMETRY**
Adwait Deshpande, Mohit U. Karkhanis, Chayanjit Ghosh, Hanseup Kim, and Carlos H. Mastrangelo
University of Utah, USA

a - Bio and Medical MEMS

Manufacturing for Bio- & Medical MEMS

T208-a **ELECTROHYDRODYNAMIC NEBULISER (eNEB) FOR DIRECT PULMONARY DRUG DELIVERY APPLICATION**
Trung-Hieu Vu[1], Luan Ngoc Mai[2,3], Tuan-Hung Nguyen[1], Dang Tran[1], Tuan-Khoa Nguyen[1], Thanh Nguyen[4], Jarred Fastier-Woollel[1,5], Canh-Dung Tran[4], Toan Dinh[4], Hong-Quan Nguyen[1], Dzung Viet Dao[1], and Van Thanh Dau[1]
[1]Griffith University, AUSTRALIA, [2]Ho Chi Minh City University of Technology (HCMUT), VIETNAM
[3]Vietnam National University, VIETNAM, [4]University of Southern Queensland, AUSTRALIA, and
[5]University of Tokyo, JAPAN

W308-a **FLEXIBLE POLYMER OPTICAL WAVEGUIDES FOR INTEGRATED OPTOGENETIC BRAIN IMPLANTS**
Julian A. Singer[1], Till Stramm[2], Jens Fasel[2], Oliver Schween[2], Anton Gelaeschus[1], Andreas Bahr[1,3], and Matthias Kuhl[4]
[1]Hamburg University of Technology, GERMANY, [2]TU Dortmund University, GERMANY,
[3]University of Kiel, GERMANY, and [4]University of Freiburg, GERMANY

M109-a **HIGHLY REPRODUCIBLE TISSUE POSITIONING WITH TAPERED PILLAR DESIGN IN ENGINEERED HEART TISSUE PLATFORMS**
Milica Dostanic[1,2], 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]Delft University of Technology, NETHERLANDS, [2]Leiden University Medical Center, NETHERLANDS, and [3]University of Twente, NETHERLANDS

T209-a **IN VITRO ASSEMBLY OF MUSCLE RINGS AND BIOPRINTED HYDROGEL FOR BRANCHING TUBULAR TISSUE CONSTRUCTS**
Tomohiro Morita, Byeongwook Jo, Minghao Nie, and Shoji Takeuchi
University of Tokyo, JAPAN

W309-a **MICROELECTRODES FABRICATED BY VACUUM FILLING WITH LOW MELTING-POINT ALLOY FOR MUSCLE TISSUE STIMULATION**
Tingyu Li, Minghao Nie, Yuya Morimoto, and Shoji Takeuchi
University of Tokyo, JAPAN

M110-a **OPTOELECTRONIC INTEGRATED ULTRAMICROELECTRODE FOR OPTICAL STIMULATION AND ELECTRICAL RECORDING OF SINGLE-CELL**
Qingda Xu, Ye Xi, Zhiyuan Du, Longchun Wang, Tao Ruan, Mengfei Xu, Jiawei Cao, Bin Yang, and Jingquan Liu
Shanghai Jiao Tong University, CHINA

T210-a **THERMOFORMING OF PARYLENE C TO FORM HELICAL STRUCTURES**
Brianna L. Thielen and Ellis Meng
University of Southern California, Los Angeles, USA

a - Bio and Medical MEMS
Materials for Bio- and Medical MEMS

W310-a **FABRICATION OF BIODEGRADABLE SOFT TISSUE-MIMICKED MICROELECTRODE ARRAYS FOR IMPLANTED NEURAL INTERFACING**
Wei-Chen Huang[1], Wan-Lou Lei[1], and Chih-Wei Peng[2]
[1]National Yang Ming Chiao Tung University, TAIWAN and [2]Taipei Medical University, TAIWAN

a - Bio and Medical MEMS
Medical Microsystems

M111-a **AN OPTIMIZATION OF PERFORATION DESIGN ON A PIEZOELECTRIC-BASED SMART STENT FOR BLOOD PRESSURE MONITORING AND LOW-FREQUENCY VIBRATIONAL ENERGY HARVESTING**
Jun Ying Tan[1], Sayemul Islam[2], Yuankai Li[3], Albert Kim[2], and Jungkwun "JK" Kim[1]
[1]University of North Texas, USA, [2]University of South Florida, USA, and [3]Kansas State University, USA

W311-a **DEVELOPMENT OF AN ELECTRICAL-STIMULATION-INDUCED MECHANOMYOGRAM PROBE FOR MUSCLE CONTRACTION CHARACTERISTICS EVALUATION**
Yusuke Takei, Toshihiro Takeshita, Daniel Zymelka, and Takeshi Kobayashi
National Institute of Advanced Industrial Science and Technology (AIST), JAPAN

M112-a **DUAL-FREQUENCY PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCERS FOR FUNDAMENTAL AND HARMONIC IMAGING**
Yanfen Zhai, Waleed Maqsood, Zhou Da, Nikolai Andrianov, Yucheng Zhang, Mohssen Moridi, and Lixiang Wu
Silicon Austria Labs GmbH, AUSTRIA

T212-a **FRACTAL MICROELECTRODES INTEGRATED WITH THE CATHETER FOR LOW-VOLTAGE PULSED FIELD ABLATION**
Mengfei Xu[1], Mu Qin[2], Ziliang Song[3], Wen Hong[1], Qingda Xu[1], Jiawei Cao[1],
Kejun Tu[1], Longchun Wang[1], Bin Yang[1], and Jingquan Liu[1]
[1]Shanghai Jiao Tong University, CHINA,
[2]Shanghai Chest Hospital Affiliated to Shanghai Jiao Tong University, CHINA, and
[3]Shanghai General Hospital Shanghai Jiao Tong University School of Medicine, CHINA

W312-a **HIERARCHICAL BONDING YIELD TEST STRUCTURE FOR FLEXIBLE HIGH CHANNEL-COUNT NEURAL PROBES INTERFACING ASIC CHIPS**
Marie C. Odenthal, Victor Claar, Oliver Paul, and Patrick Ruther
University of Freiburg, GERMANY

M113-a **MICROWAVE-INDUCED THERMOACOUSTIC IMAGING USING ALUMINUM NITRIDE PMUT**
Yiwei Wang[1], Lejia Zhang[1], Junxiang Cai[1,2,3], Baosheng Wang[1,2,3],
Yuandong Alex Gu[5], Liang Lou[5], Xiong Wang[1,2,3,4], and Tao Wu[1,2,3,4]
[1]ShanghaiTech University, CHINA and [2]Chinese Academy of Sciences, CHINA, [3]University of Chinese Academy of Sciences, CHINA, [4]Shanghai Engineering Research Center of Energy Efficient and Custom AI IC, CHINA, and [5]Shanghai Industrial μTechnology Research Institute, CHINA

T213-a **NEEDLE-FREE DRUG INJECTION USING A SHOCK WAVE FOCUSING SYSTEM WITH THE FUNCTION OF REAL-TIME MICROBUBBLE-BASED DISTANCE SENSING**
Yibo Ma, Wenjing Huang, Keita Ichikawa, and Yoko Yamanishi
Kyushu University, JAPAN

W313-a **NEW WAFER-LEVEL FABRICATION OF ULTRATHIN SILICON INSERTION SHUTTLES FOR FLEXIBLE NEURAL IMPLANTS**
Kirti Sharma[1], Christian Boehler[1], Maria Asplund[1,2], Oliver Paul[1], and Patrick Ruther[1]
[1]University of Freiburg, GERMANY and [2]Chalmers University of Technology, SWEDEN

M114-a **REAL-TIME DYNAMIC LACTATE DETECTION IN A PIPELINE USING A MICROSENSING NEEDLE FOR ICU PATIENT MONITORING APPLICATION**
Yuan-Sin Tang[1], Tung-Lin Yang[2], Yu-Ting Cheng[1], Hsiao-En Tsai[2,3], and Yih-Shurng Chen[3,4]
[1]National Yang Ming Chiao Tung University, TAIWAN, [2]National Taiwan Hospital HsinChu Branch, TAIWAN, [3]National Taiwan University College of Medicine Graduate Institute of Clinical Medicine, TAIWAN, and [4]National Taiwan University Hospital, TAIWAN

T214-a **THREE-DIMENSIONAL FLEXIBLE NEURAL OPTO-ELECTRONIC ARRAY WITH SILK-BASED SHUTTLE-FREE IMPLANTATION**
Chi Gu[2,3], Huiran Yang[2], Bohan Zhang[2,4], Zhitao Zhou[2], Liuyang Sun[2,3], Meng Li[2,3], Xiaoling Wei[2,3]
and Tiger H. Tao[1,2,3,4,5,6]
[1]Guangdong Institute of Intelligence Science and Technology, CHINA, [2]Chinese Academy of Sciences, CHINA, [3]University of Chinese Academy of Sciences, CHINA, [4]ShanghaiTech University, CHINA, [5]Neuroxess Co., Ltd. (Jiangxi), CHINA, and [6]Tianqiao and Chrissy Chen Institute for Translational Research, CHINA

a - Bio and Medical MEMS

MEMS & BioMEMS for Fighting COVID-19 & Future Pandemic

W314-a **A MICROFLUIDIC BIOSENSOR FOR RAPID DETECTION OF COVID-19**
Sura A. Muhsin[1], Ying He[1], Muthana Al-Amidie[1], Karen Sergovia[1], Amjed Abdullah[1],
Yang Wang[1], Omar Alkorjia[1], Robert A. Hulsey[2], Gary L. Hunter[2], Zeynep Erdal[2], Ryan J. Pletka[2],
George S. Hyleme[2], Xiu-Feng Wan[1,2], and Mahmoud Almasri[1]
[1]University of Missouri, USA and [2]Black and Veatch, KANSAS

M115-a **A LOOP-MEDIATED ISOTHERMAL AMPLIFICATION (LAMP)-BASED POINT-OF-CARE SYSTEM FOR RAPID ON-SITE CLINICAL DETECTION OF SARS-COV-2 VIRUSES**
Trieu Nguyen[1], Aaydha Chidambara Vinayaka[1], Van Ngoc Huynh[1], Quyen Than Linh[1],
Sune Zoëga Andreasen[1], Mohsen Golabi[1], Dang Duong Bang[1], Jens Kjølseth Møller[2], and Anders Wolff[1]
[1]Technical University of Denmark, DENMARK and [2]University Hospital of Southern Denmark, DENMARK

a - Bio and Medical MEMS
MEMS & BioMEMS for Healthcare and Public Health

T215-a **A SOLAR-DRIVEN WEARABLE MULTIPLEXED BIO-SENSING SYSTEM FOR NONINVASIVE HEALTHCARE MONITORING IN SWEAT**
Jujhar Singh, Bianca Ning, Paul Lee, and Lin Liu
Seattle Pacific University, USA

W315-a **HIGH-THROUGHPUT MASS MEASUREMENT OF SINGLE BACTERIAL CELLS BY SILICON NITRIDE MEMBRANE RESONATORS**
Adrián Sanz-Jiménez[1], Oscar Malvar[1], Jose J. Ruz[1], Sergio García-López[1], Priscila M. Kosaka[1], Eduardo Gil-Santos[1], Álvaro Cano[1], Dimitris Papanastasiou[2], Diamantis Kounadis[2], Elias Panagiotopoulos[2], Jesús Mingorance[3], María Rodríguez-Tejedor[3], Álvaro San Paulo[1], Montserrat Calleja[1], and Javier Tamayo[1]
[1]Instituto de Micro y Nanotecnología, SPAIN, [2]Fasmatech Science & Technology, Lefkippos TESPA, Demokritos NCSR, Patriarchou Gregoriou & Neapoleos, GREECE, and
[3]Hospital Universitario La Paz, Madrid, SPAIN

M116-a **MICROFABRICATED ISOTHERMAL EG-FET SENSOR FOR LAMP MEDIATED CRISPR/CAS12A DETECTION OF HEPATITIS C VIRUS**
Hsin-Ying Ho, Wei-Sin Kao, Piyush Deval, Ling-Shan Yu, and Che-Hsin Lin
National Sun Yat-sen Universit, TAIWAN

T216-a **SMART ELECTRODE ARRAY FOR COCHLEAR IMPLANTS**
Ahmad Itawi[1], Sofiane Ghenna[1], Guillaume Tourrel[2], Sébastien Grondel[1], Cedric Plesse[3], Tran Minh Giao Nguyen[3], Frédéric Vidal[3], Yinoussa Adagolodjo[4], Lingxiao Xun[4], Gang Zheng[4], Alexandre Kruszewski[4], Christian Duriez[4], and Eric Cattan[1]
[1]University Polytechnique Hauts-de-France, FRANCE, [2]Oticon Medical, FRANCE,
[3]CY Cergy Paris Université, FRANCE, and [4]University of Lille, FRANCE

a - Bio and Medical MEMS
Tissue Engineering

W316-a **A THREE-DIMENSIONAL ARTIFICIAL INTESTINAL TISSUE WITH A CRYPT-LIKE INNER SURFACE**
Shuma Tanaka[1], Shun Itai[2], and Hiroaki Onoe[1]
[1]Keio University, JAPAN and [2]Tohoku University, JAPAN

M117-a **TISSUE-ENGINEERED PENNATE MUSCLES ON A CHIP**
Motoki Ito, Yuya Morimoto, and Shoji Takeuchi
University of Tokyo, JAPAN

T217-a **WEIGHT TRAINING DEVICE TO PROMOTE MATURATION IN SKELETAL MUSCLE TISSUES**
Kentaro Motoi, Byeongwook Jo, Yuya Morimoto, and Shoji Takeuchi
University of Tokyo, JAPAN

a - Bio and Medical MEMS
Other Bio and Medical MEMS

W317-a **MICROSYSTEM VIBRATING MESH ATOMIZER WITH INTEGRATED MICROHEATER FOR HIGH VISCOSITY LIQUID AEROSOL GENERATION**
Pallavi Sharma, Irma Rocio Vazquez, and Nathan Jackson
University of New Mexico, USA

M118-a **SCALABLE MODULAR MEASUREMENT SYSTEM FOR CONTINUOUS BLOOD MONITORING WITH PIEZOELECTRIC MEMS RESONATORS**
Michael Schneider[1], Bernhard Kößl[1], Suresh Alasatri[1], Ingrid A.M. Magnet[2], and Ulrich Schmid[1]
[1]TU Wien, AUSTRIA and [2]Medical University of Vienna, AUSTRIA

T218-a **SILICON COMPATIBLE PROCESS TO INTEGRATE IMPEDANCE CYTOMETRY WITH MECHANICAL CHARACTERIZATION**
Quentin Rezard[1], Faruk Azam Shaik[1,2], Jean Claude Gerbedoen[1,2], Fabrizio Cleri[1], Dominique Collard[1,2], Chann Lagadec[1], and Mehmet C. Tarhan[1,2]
[1]University of Lille, FRANCE and [2]University of Tokyo, Lille, FRANCE

W318-a **SORTING OF EXTRACELLULAR VESICLES BY USING OPTICALLY-INDUCED DIELECTROPHORESIS ON AN INTEGRATED MICROFLUIDIC CHIP**
Wei-Jen Soong, Chih-Hung Wang, Yi-Sin Chen, Chihchen Chen, and Gwo-Bin Lee
National Tsing Hua University, TAIWAN

b - Emerging Technologies and New Opportunities for MEMS/NEMS
Internet of Things (IoT) with MEMS/NEMS

M119-b **A REPROGRAMMABLE MEM SWITCH UTILIZING CONTROLLED CONTACT WELDING**
Tsegereda K. Esatu, Hei Kam, Lars P. Tatum, Xiaoer Hu, Urmita Sikder,
Sergio Almeida, Junqiao Wu, and Tsu-Jae King Liu
University of California, Berkeley, USA

T219-b **MICROMECHANICAL RSSI BASED ON FORCE INTERACTION DERIVED TAPPING BANDWIDTH VARIATION IN VIBRO-IMPACT RESONATORS**
Yi-Hsuan Huang, Hong-Sen Zheng, Chun-Pu Tsai, and Wei-Chang Li
National Taiwan University, TAIWAN

W319-b **WAKE-UP IOT WIRELESS SENSING NODE BASED ON A LOW-G THRESHOLD MEMS INERTIAL SWITCH WITH RELIABLE CONTACTS**
Sagnik Ghosh[1], Duan Jian Goh[1], Yul Koh[1], Jaibir Sharma[1], Wei Da Toh[1],
Weiguo Chen[1], Yao Zhang[1], Eldwin Ng[1], Amit Lal[2], and Joshua E.-Y. Lee[1]
*[1]Agency for Science, Technology and Research (A*STAR), SINGAPORE and [2]Cornell University, USA*

b - Emerging Technologies and New Opportunities for MEMS/NEMS
Machine Learning (ML) & Artificial Intelligence (AI) Enhanced MEMS/NEMS Design, Manufacturing, and Applications

M120-b **ARTIFICIAL INTELLIGENCE (AI)-ENHANCED E-SKIN WITH ARTIFICIAL SYNAPSE SENSORY OUTPUT FOR HUMANOID ROBOTIC FINGER OF MULTIMODAL PERCEPTION**
Xinge Guo[1,2] and Chengkuo Lee[1]
[1]National University of Singapore, SINGAPORE and
*[2]Agency for Science, Technology and Research (A*STAR), SINGAPORE*

T220-b **MULTI-MEMS DIFFERENTIAL PRESSURE SENSOR ELEMENTS-BASED AIRFLOW SENSOR WITH NEURAL NETWORK MODEL**
Kotaro Haneda, Kenei Matsudaira, and Hidetoshi Takahashi
Keio University, JAPAN

W320-b **TRIAL-AND-ERROR LEARNING FOR MEMS STRUCTURAL DESIGN ENABLED BY DEEP REINFORCEMENT LEARNING**
Fanping Sui[1], Wei Yue[1], Ziqi Zhang[2], Ruiqi Guo[1], and Liwei Lin[1,2]
[1]University of California, Berkeley, USA and [2]TSinghua University, CHINA

b - Emerging Technologies and New Opportunities for MEMS/NEMS
New Computing Devices and Systems with MEMS/NEMS

M121-b **FULLY MICROELECTROMECHANICAL NON-VOLATILE MEMORY CELL.**
Elliott Worsey, Mukesh K. Kulsreshath, Qi Tang, and Dinesh Pamunuwa
University of Bristol, UK

T221-b **NONVOLATILE STATE CONFIGURATION OF NANO-WATT PARAMETRIC ISING SPINS THROUGH FERROELECTRIC HAFNIUM ZIRCONIUM OXIDE MEMS VARACTORS**
Nicolas Casilli[1], Onurcan Kaya[1], Tahmid Kaisar[2], Benyamin Davaji[1],
Philip X.-L. Feng[2], and Cristian Cassella[1]
[1]Northeastern University, USA and [2]University of Florida, USA

W321-b **PHYSICAL RESERVOIR COMPUTING USING NONLINEAR MEMS RESONATOR HAVING HIGH MEMORY CAPACITY AT "EDGE OF CHAOS"**
Hiroki Takemura, Takahiro Mizumoto, Amit Banerjee, Jun Hirotani, and Toshiyuki Tsuchiya
Kyoto University, JAPAN

M122-b **PROGRAMMABLE FERROELECTRIC HZO NEMS MECHANICAL MULTIPLIER FOR IN-MEMORY COMPUTING**
Shubham Jadhav, Ved Gund, and Amit Lal
Cornell University, USA

T222-b **STORING MEMS INTERFACES WITHOUT ELECTRICAL AUXILIARY ENERGY FOR LONG-TIME MONITORING**
Martin Hoffmann[1], Philip Schmitt[1], Steffen Wittemeier[3], Falk Schaller[2], Alexey Shaporin[3],
Chris Stöckel[2,3], Volker Geneiß[3], Roman Forke[3], Christian Hedayat[3], Ulrich Hilleringmann[4],
Harald Kuhn[2,3], and Sven Zimmermann[2,3]
[1]Ruhr-Universität Bochum, GERMANY, [2]Chemnitz University of Technology, GERMANY, [3]Fraunhofer Institute for Electronic Nano Systems ENAS, GERMANY, and [4]University of Paderborn, GERMANY

b - Emerging Technologies and New Opportunities for MEMS/NEMS
Nonlinear Dynamics in MEMS/NEMS

W322-b **A NEW FINDING ON NONLINEAR DAMPING AND STIFFNESS OF FLEXURAL MODE CAPACITIVE MEMS RESONATORS**
Hung-Yu Chen, Ming-Huang Li, and Sheng-Shian Li
National Tsing Hua University, TAIWAN

M123-b **EXPLOITING PARAMETRIC INSTABILITY IN BISTABLE MEMS ACTUATORS**
Daniel Platz, Johannes Fabian, Elisabeth Samm, Mahdi Mortada, Michael Schneider, and Ulrich Schmid
TU Wien, AUSTRIA

T223-b **FIRST PROTOTYPE OF POLYMER MICROMACHINED FLAPPING WING NANO AIR VEHICLE**
Rashmikant, Ryotaro Suetsugu, Minato Onishi, and Daisuke Ishihara
Kyushu Institute of Technology, JAPAN

W323-b **ITERATIVE LEARNING CONTROL FOR QUASI-STATIC MEMS MIRROR WITH SWITCHING OPERATION**
Matthias Macho[1], Han Woong Yoo[1], Richard Schroedter[2], and Georg Schitter[1]
[1]TU Wien, AUSTRIA and [2]TU Dresden, GERMANY

b - Emerging Technologies and New Opportunities for MEMS/NEMS
Quantum Devices and Systems with MEMS/NEMS

M124-b ***Mz*** **ATOMIC MAGNETOMETER USING A 3D MEMS GLASS ALKALI VAPOR CELL WITH VERTICAL SIDEWALLS**
Jin Zhang, Jianfeng Zhang, Wenqi Li, Ziji Wang, and Jintang Shang
Southeast University, CHINA

T224-b **ON-CHIP HEATING NOISE SUPPRESSION OF 3D CHIP-SCALE ATOMIC MAGNETOMETER USING SINGLE-LAYER SHIFTED HEATER**
Ziji Wang, Junming Wu, Jin Zhang, and Jintang Shang
Southeast Unversity, CHINA

c - Industry MEMS and Advancing MEMS for Products and Sustainability
Barriers to Commercialization & Research Needs for Future Products

W324-c **LABOR-SAVING PLATFORM FOR CHARACTERIZATION OF MEMBRANE PROTEINS BY AUTOMATED MONITORING AND DATA REPORTING**
Kazuto Ogishi[1], Toshihisa Osaki[2], Yuya Morimoto[1], and Shoji Takeuchi[1,2]
[1]University of Tokyo, JAPAN and [2]Kanagawa Institute of Industrial Science and Technology, JAPAN

c - Industry MEMS and Advancing MEMS for Products and Sustainability
MEMS Packaging Techniques

M125-c **MODELLING IMPACT OF VISCOELASTIC PROPERTIES OF DIE-ATTACH MATERIAL ON THE BIAS RESPONSE OF RESONANT INERTIAL SENSORS**
Theo Miani[1], Lokesh Gurung[1], Guillermo Sobreviela-Falces[1], Douglas Young[1], Colin Baker[1], and Ashwin A. Seshia[2]
[1]Silicon Microgravity Ltd., UK and [2]University of Cambridge, UK

c - Industry MEMS and Advancing MEMS for Products and Sustainability
MEMS/NEMS - CMOS Integration

T225-c **CMOS-EMBEDDED 3D MICRO/NANOFLUIDICS EMPLOYING TOP-DOWN BEOL SINGLE-STEP WET-ETCHING TECHNIQUE**
Wei-Yang Weng, Hung-Yu Hou, Yueh-Jung Chao, Shwu-Jen Liaw, and Jun-Chau Chien
National Taiwan University, TAIWAN

W325-c **IMPLEMENTATION OF A MONOLITHIC SOC ENVIRONMENTAL SENSING HUB USING CMOS-MEMS TECHNIQUE**
Ya-Chu Lee[1], Tung-Lin Chien[1], Chi-Te Fang[1], Yuanyuan Huang[1], Wei-Lun Sung[2], Yen-Chang Chu[2], Rongshun Chen[1], and Weileun Fang[1]
[1]National Tsing Hua University, TAIWAN and [2]PixArt Imaging Inc., TAIWAN

M126-c **MONOLITHICALLY AND VERTICALLY INTEGRATED ENVIRONMENTAL SENSING HUB WITH NOVEL AIR-BASED HUMIDITY SENSOR DESIGN**
Tung-Lin Chien, Yuanyuan Huang, Fuchi Shih, and Weileun Fang
National Tsing Hua University, TAIWAN

c - Industry MEMS and Advancing MEMS for Products and Sustainability
New MEMS System Design and Integration Approaches

T226-c **A SELF-CORRECTED, SELF-CLEANED MEMS AND SUITABLE FOR ADVANCED FOUNDRY MULTI-PROJECT WAFER (MPW)**
Sushil Kumar, Dhairya Singh Arya, Manu Garg, and Pushpapraj Singh
Indian Institute of Technology, New-Delhi, INDIA

W326-c **MONOLITHIC INTEGRATION OF HUMIDITY/FLOW/TEMPERATURE SENSORS AS ENVIRONMENT SENSING HUB FOR APPARENT-TEMPERATURE DETECTION**
Yu-Hsuan Li, Tung-Lin Chien, Fuchi Shih, Yuanyuan Huang, and Weileun Fang
National Tsing Hua University, TAIWAN

M127-c **PIEZORESISTIVE PRESSURE SENSOR WITH MONOLITHICALLY INTEGRATED AMPLIFIER BASED ON METAL-OXIDE TRANSISTORS**
Runxiao Shi[1], Dequan Lin[1], Kevin Chau[1,2], and Man Wang[1]
[1]Hong Kong University of Science and Technology, HONG KONG and
[2]Chinese Academy of Sciences, CHINA

d - Materials, Fabrication and Packaging for Generic MEMS and NEMS
Advancement in Conventional Materials for MEMS & NEMS

T227-d **A PERFORMANCE ENHANCEMENT METHOD FOR THERMOPILE SENSORS USING A CHIP PROBE TEST SYSTEM**
Meng Shi[1,2], Mao Li[1,2], Yue Ni[3], Chenchen Zhang[1], Na Zhou[1,2], Haiyang Mao[1,2], and Chengjun Huang[1,2]
[1]Chinese Academy of Sciences, CHINA, [2]University of Chinese Academy of Sciences, CHINA, and [3]Jiangsu Hinovaic Technologies Co., Ltd, CHINA

W327-d **CHARACTERIZING INDUCTIVELY-COUPLED-PLASMA ETCHING OF SINGLE CRYSTALLINE LITHIUM TANTALATE FOR MICRO-ACOUSTIC APPLICATIONS**
Yasaman Majd, Jorge Manrique Castro, Hakhamanesh Mansoorzare, and Reza Abdolvand
University of Central Florida, USA

M128-d **ROBUST POLYCRYSTALLINE 3C-SIC-ON-SI HETEROSTRUCTURES WITH LOW CTE MISMATCH UP TO 900 °C FOR MEMS**
Philipp Moll, Georg Pfusterschmied, and Ulrich Schmid
TU Wien, AUSTRIA

d - Materials, Fabrication and Packaging for Generic MEMS and NEMS
Digital Micromanufacturing

T228-d **A 3D PRINTED FUNCTIONAL MEMS ACCELEROMETER**
Simone Pagliano[1], David E. Marschner[1], Damien Maillard[2], Nils Ehrmann[3], Göran Stemme[1], Stefan Braun[3], Luis Guillermo Villanueva[2], and Frank Niklaus[1]
[1]KTH Royal Institute of Technology, SWEDEN, [2]École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND, and [3]Hochschule Kaiserslautern, GERMANY

W328-d **A FULLY 3D PRINTED METHOD FOR MONOLITHIC INTEGRATION OF AN ACCELEROMETER AND A FORCE SENSOR**
Guandong Liu[1,2], Changhai Wang[1], Kexin Wang[1], Zhili Jia[3], Ruiqi Luo[2], and Wei Ma[2,4]
[1]Heriot-Watt University, UK, [2]Zhejiang Lab, CHINA, [3]National Institute of Metrology, CHINA, and [4]Zhejiang University, CHINA

d - Materials, Fabrication and Packaging for Generic MEMS and NEMS
Generic MEMS & NEMS Manufacturing Techniques

M129-d **CHARACTERIZATION OF VAPOR HF SACRIFICIAL ETCHING THROUGH SUBMICRON RELASE HOLES FOR WAFER-LEVEL VACUUM PACKAGING BASED ON SILICON MIGRATION SEAL**
Tianjiao Gong[1], Yukio Suzuki[1], Muhammad J. Khan[1], Karla Hiller[2], and Shuji Tanaka[1]
[1]Tohoku University, JAPAN and [2]Fraunhofer Institute for Electronic Nano Systems, GERMANY

T229-d **DAMAGE PROFILE MODELING AND EXPERIMENT OF SILICON CARBIDE SUBSTRATES IN MICRO-NANO STRUCTURE FABRICATED BY HELIUM FOCUSED ION BEAM**
Shupeng Gao, Xi Chen, Qianhuang Chen, Qi Li, and Yan Xing
Southeast University, CHINA

W329-d **LIQUID-IMMERSION INCLINED-ROTATED UV LITHOGRAPHY FOR MICRO SUCTION CUP ARRAY**
Gakuto Kagawa and Hidetoshi Takahashi
Keio University, JAPAN

d - Materials, Fabrication and Packaging for Generic MEMS and NEMS
New & Emerging Materials for MEMS/NEMS

M130-d **PARAMETRIC AMPLIFICATION AND PHONONIC FREQUENCY COMB GENERATION IN MoS_2 NANOELECTROMECHANICAL RESONATORS**
S M Enamul Hoque Yousuf[1], Yunong Wang[1], Jaesung Lee[1], Steven W. Shaw[2,3], and Philip X.-L. Feng[1]
[1]University of Florida, USA, [2]Florida Institute of Technology, USA, and [3]Michigan State University, USA

T230-d **PARYLENE-N AS A HIGH TEMPERATURE THIN FILM PIEZOELECTRIC MATERIAL**
Nathan Jackson and Deepak Kunwar
University of New Mexico, USA

W330-d **SILICON CARBIDE-ON-INSULATOR THERMAL-PIEZORESISTIVE RESONATOR FOR HARSH ENVIRONMENT APPLICATION**
Baoyun Sun[1,2], Jiarui Mo[1], Hemin Zhang[3], Henk W. van Zeijl[1], Willem D. van Driel[1], and Guoqi Zhang[1]
[1]Delft University of Technology, NETHERLANDS, [2]China University of Petroleum, CHINA, and [3]KU Leuven, BELGIUM

M131-d **SPIN COATING OF HIGHLY ALIGNED AGCN MICROWIRES EPITAXIALLY GROWN ON 2D MATERIALS**
Jimin Ham, Jaemook Lim, Joowon Lim, Gunyoung Jang, Sueng Yoon Lee,
Dohyun Lim, Sukjoon Hong, and Won Chul Lee
Hanyang Universit, Ansan, KOREA

T231-d **SUSPENDED TWO-DIMENSIONAL MATERIAL MEMBRANES FOR SENSOR APPLICATIONS FABRICATED WITH A HIGH-YIELD TRANSFER PROCESS**
Sebastian Lukas[1], Ines Kraiem[1,2], Maximilian Prechtl[3], Oliver Hartwig[3], Annika Grundmann[1], Holger Kalisch[1], Satender Kataria[1], Michael Heuken[1,4], Andrei Vescan[1], Georg S. Duesberg[3], and Max C. Lemme[1,2]
[1]RWTH Aachen University, GERMANY, [2]AMO GmbH, GERMANY,
[3]University of the Bundeswehr Munich, GERMANY, and [4]AIXTRON SE, GERMANY

W331-d **TCF-IMPROVED SH_0 MODE ACOUSTIC RESONATORS BASED ON 30°YX-$LINBO_3$/SIO_2 MEMBRANE**
Shuxian Wu[1], Zonglin Wu[1], Hangyu Qian[1], Feihong Bao[1],
Gongbin Tang[2], Feng Xu[1], and Jie Zou[1]
[1]Fudan University, CHINA and [2]Shandong University, CHINA

M132-d **WAFER SCALE MULTILAYER GRAPHENE BASED BRAIN PROBES BY SPIN-SPRAYING METHODS FOR MAGNETIC RESONANCE IMAGING**
Kejun Tu, Zhejun Guo, Mengfei Xu, Bin Yang, and Jingquan Liu
Shanghai Jiao Tong University, CHINA

d - Materials, Fabrication and Packaging for Generic MEMS and NEMS
New Fabrication Processes for Making MEMS/NEMS

T232-d **3D SELF-ALIGNED FABRICATION OF SUSPENDED NANOWIRES BY CRYSTALLOGRAPHIC NANOLITHOGRAPHY**
Erwin J.W. Berenschot, Yasser Pordeli, Lucas J. Kooijman, Yves L. Janssens,
Roald M. Tiggelaar, and Niels R. Tas
University of Twente, NETHERLANDS

W332-d **A SIMPLE PROCESS FOR THE FABRICATION OF PARALLEL-PLATE ELECTROSTATIC MEMS RESONATORS BY GOLD THERMOCOMPRESSION BONDING**
Dolores Manrique Juarez[1], Fabrice Mathieu[1], Guillaume Libaude[1], David Bourrier[1],
Samuel Charlot[1], Laurent Mazenq[1], Véronique Conédéra[1], Ludovic Salvagnac[1],
Isabelle Dufour[2], Liviu Nicu[1], and Thierry Leïchlé[1,3]
[1]LAAS-CNRS, FRANCE, [2]Université de Bordeaux, IMS UMR-CNRS, FRANCE, and [3]Georgia Tech, USA

M133-d **ELECTROMECHANICALLY STABLE INTERCONNECTION BETWEEN LIG AND THICK DAM-SHAPED METALLIC ELECTRODE VIA STORED AG MICROPARTICLE SOLUTION**
Saeyoung Park, Yoo-Kyum Shin, and Min-Ho Seo
Pusan National University, KOREA

T233-d **FREE-STANDING MEMBRANES WITH SELF-ASSEMBLED NANOPORE ARRAYS FOR TEM OBSERVATION OF LIQUID SAMPLES**
Joowon Lim[1], Jimin Ham[1], Sungho Jeon[1], Yuna Bae[2,3], Minho Kang[2,3], Sueng Yoon Lee[1], Jungwon Park[2,3], and Won Chul Lee[1]
[1]Hanyang University, KOREA, [2]Seoul National University, KOREA, and [3]Institute of Basic Science (IBS), KOREA

W333-d **NONPLANAR NANOFABRICATION VIA INTERFACE ENGINEERING**
Sarah O. Spector, Peter F. Satterthwaite, and Farnaz Niroui
Massachusetts Institute of Technology, USA

M134-d **WAFER-LEVEL FABRICATION OF CONFORMAL SUB 10-NM NANOGAPS**
Sayali Tope, Seungbeom Noh, and Hanseup Kim
University of Utah, USA

d - Materials, Fabrication and Packaging for Generic MEMS and NEMS
Packaging & Assembly

T234-d **MEMS RESONATOR VACUUM-SEALED BY SILICON MIGRATION AND HYDROGEN OUTDIFFUSION**
Muhammad Jehanzeb Khan, Yukio Suzuki, Tianjiao Gong, Takashiro Tsukamoto, and Shuji Tanaka
Tohoku University, JAPAN

W334-d **MEMS THIN-FILM VACUUM PACKAGE UTILIZING GLOW DISCHARGE GETTER**
Vikram Maharshi, Manjeet Kumar, Ajay Agarwal, and Bhaskar Mitra
Indian Institute of Technology, Jodhpur, INDIA

e – MEMS Actuators and PowerMEMS
Actuator Components & Systems

M135-e **LNOI THIN-FILM DUAL-AXIS RESONANT MICRO-MIRROR WITH E16 TORSIONAL ACTUATION**
Yaoqing Lu[1,2,3], Kangfu Liu[1,2,3], Yuxi Wang[1,2,3], Ran Nie[1], and Tao Wu[1,2,3,4]
[1]ShanghaiTech University, CHINA, [2]Chinese Academy of Sciences, CHINA, [3]University of Chinese Academy of Sciences, CHINA, and [4]Shanghai Engineering Research Center of Energy Efficient and Custom AI IC, CHINA

T235-e **A PIEZOELECTRIC MEMS SPEAKER WITH STRETCHABLE FILM SEALING**
Linbing Xu, Mingchao Sun, Menglun Zhang, Chengze Liu, Xiaopeng Yang, and Wei Pang
Tianjin University, CHINA

W335-e **BROADBAND MEMS SPEAKER BY SINGLE-WAY MULTI-RESONANCE ARRAY WITH ACOUSTIC DAMPING TUNING: A PROOF OF CONCEPT**
Mingchao Sun, Menglun Zhang, Chengze Liu, and Wei Pang
Tianjin University, CHINA

M136-e **IONIC LIQUID ELECTROSPRAY THRUSTER WITH TWO-STAGE ELECTRODES ON GLASS SUBSTRATE**
Akane Nishimura[1], Yoshinori Takao[2], Toshiyuki Tsuchiya[1], and Yoshinori Takao[2]
[1]Kyoto University, JAPAN and [2]Yokohama National University, JAPAN

W336-e **MONOLITHIC INTEGRATION OF PZT ACTUATION UNITS OF VARIOUS ACTIVATED RESONANCES FOR FULL-RANGE MEMS SPEAKER ARRAY**
Hsu-Hsiang Cheng[1], Sung-Cheng Lo[1], Yu-Chen Chen[1], Ming-Ching Cheng[1], Ting-Chou Wei[1], Mingching Wu[2], and Weileun Fang[1]
[1]National Tsing Hua University, TAIWAN and [2]CoretronicMEMS Co., Ltd., TAIWAN

M137-e **PULL-IN VOLTAGE REDUCTION IN ELECTROSTATIC AIRGAP ACTUATOR USING 12 NM-ULTRATHIN INTERNAL DIELECTRIC TRANSDUCTION**
Satish K. Verma and Bhaskar Mitra
Indian Institute of Technology, New Delhi, INDIA

e – MEMS Actuators and PowerMEMS
Energy Harvesting Materials, Structures, and Transducers

T237-e **A REVERSE ELECTROWETTING-ON-DIELECTRIC (REWOD) ENERGY HARVESTER USING NONWETTING GALLIUM COATED ELECTRODE AND ULTRATHIN GALLIUM OXIDE SHELL AS DIELECTRIC LAYER**
Jinwon Jeong, Bokyung Suh, and Jeong Bong (JB) Lee
University of Texas at Dallas, USA

W337-e **ASYMMETRIC QUAD LEG ORTHOPLANAR SPRING FOR WIDEBAND PIEZOELECTRIC MICRO ENERGY HARVESTING**
Ali Mohammadi, Shamin Sadrafshari, Alborz Shokrani, and Chris R. Bowen
University of Bath, UK

M138-e **EVALUATION OF THERMOELECTRIC PROPERTIES OF MONOLITHICALLY-INTEGRATED CORE-SHELL Si NANOWIRE BRIDGES**
Akio Uesugi, Shusuke Nishiyori, Koji Sugano, and Yoshitada Isono
Kobe University, JAPAN

T238-e **GLAZE TILE-INSPIRED LIQUID-SOLID POWER GENERATOR FOR CONTINUOUS WATER FLOW ENERGY HARVESTING**
Dezhi Nie[1], Boming Lyu[1], Yongbo Hu[1], Jian Zhang[1], Yongqing Fu[2], Honglong Chang[1], and Kai Tao[1]
[1]Northwestern Polytechnical University, CHINA and [2]Northumbria University, UK

W338-e **MEMS CANTILEVERED ENERGY HARVESTER WITH TAPERED THICKNESS FOR STRESS CONTROL**
Takahito Yokota, Kensuke Kanda, Takayuki Fujita, and Kazusuke Maenaka
University of Hyogo, JAPAN

M139-e **TAPERED HELMHOLTZ RESONATOR WIND ENERGY HARVESTER DRIVEN BY AEROACOUSTICS**
Chen Hua, Liyun Zhen, Jingquan Liu, and Bin Yang
Shanghai Jiao Tong University, CHINA

e – MEMS Actuators and PowerMEMS
Manufacturing for Actuators & Power MEMS

T239-e **ANDROMEDA: A FLEXIBLE MEMS TECHNOLOGY PLATFORM FOR A VARIETY OF PIEZOELECTRICALLY ACTUACTED MICROMIRRORS**
Irene Martini, Anna Alessandri, Marta Carminati, Roberto Carminati, Paolo Ferrarini, Daniela A.L. Gatti, Riccardo Gianola, Borka Lazarova, Carla M. Lazzari, Andrea Nomellini, Laura Oggioni, Claudia Pedrini, Carlo L. Prelini, Riccardo Tacchini, and Michele Vimercati
STMicroelectronis, ITALY

W339-e **DESIGN OF BUTTERFLY PLATE PIEZOELECTRIC ACTUATOR WITH DUAL DRIVING ELECTRODES FOR MEMS MICRO-MIRROR**
Si-Han Chen[1], Shih-Chi Liu[1], Hao-Chien Cheng[1], Hung-Yu Lin[1],
Kai-Chih Liang[2], Mingching Wu[2], and Weileun Fang[1]
[1]National Tsing Hua University, TAIWAN and [2]Coretronic MEMS Corporation, TAIWAN

M140-e **FULLY-FLEXIBLE MICRO-SCALE ACTUATOR ARRAY WITH THE LIQUID-GAS PHASE CHANGE MATERIALS**
Sangjun Sim, Kyubin Bae, and Jongbaeg Kim
School of Mechanical Engineering, Yonsei University, KOREA

e – MEMS Actuators and PowerMEMS
Power MEMS Components & Systems

T240-e **A NOVEL COMB DESIGN FOR ENHANCED POWER AND BANDWIDTH IN ELECTROSTATIC MEMS ENERGY CONVERTORS**
Jinglun Li[1], Habilou Ouro-Koura[1], Hannah Arnow[1], Arian Nowbahari[2], Mathew Galarza[1], Meg Obispo[1],
Xing Tong[1], Mehdi Azadmehr[2], Mona M. Hella[1], John A. Tichy[1], and Diana-Andra Borca-Tasciuc[1]
[1]Rensselaer Polytechnic Institute, USA and [2]University of South-Eastern Norway, NORWAY

e – MEMS Actuators and PowerMEMS
Self-Powered Devices and Microsystems

W340-e **A HYBRID NANOGENERTOR-DRIVEN SELF-POWERED WEARABLE PERSPIRATION MONITORING SYSTEM**
Md Abu Zahed, S M Sohel Rana, Md Sharifuzzaman, Seonghoon Jeong,
Gagan Bahadur Pradhan, Hye Su Song, and Jae Yeong Park
Kwangwoon University, KOREA

M141-e **A MONOLITHIC INTEGRATED AND TRANSPARENT MICROSYSTEM CONSTRUCTED BY USING AMORPHOUS INGAZNO FILM**
Bin Jia, Chao Zhang, and Xiaodong Huang
Southeast University, CHINA

T241-e **FLOWING WATER ENABLES STEERABLE CHARGE DISTRIBUTION ON ELECTRET SURFACE**
Boming Lyu[1], Jian Zhang[1], Yunjia Li[2], Yongqing Fu[3], Honglong Chang[1], Weizheng Yuan[1], and Kai Tao[1]
[1]Northwestern Polytechnical University, CHINA, [2]Xi'an Jiaotong University, CHINA, and [3]University of Northumbria, UK

W341-e **SELF-POWERED FLEXIBLE PIEZOELECTRET ARRAY FOR WEARABLE APPLICATIONS**
Hao Yang[1,2], Rui M.R. Pinto[1], Pedro González[1], Alar Ainla[1],
Mohammadmahdi Faraji[1], and K.B. Vinayakumar[1]
[1]International Iberian Nanotechnology Laboratory, PORTUGAL and [2]Xi'an Jiaotong University, CHINA

f - MEMS Physical and Chemical Sensors
Fluidic Sensors

M142-f **A BULK-TYPE PRESSURE SENSOR WITH FULL-BRIDGE IMPLEMENTATION ENABLED BY STRESS-MODIFYING TRENCHES**
Dequan Lin[1], Man Wong[1], and Kevin Chau[1,2]
[1]Hong Kong University of Science and Technology, CHINA, [2]Chinese Academy of Science, CHINA

T242-f **A CMOS COMPATIBLE MICRO PIRANI GAUGE WITH STRUCTURE OPTIMIZATION FOR PERFORMANCE ENHANCEMENT**
Rui Jiao[1], Gai Yang[2], Ruoqin Wang[1], Yue Tang[2], Zhongyi Liu[2],
Huikai Xie[2,3], Hongyu Yu[1], and Xiaoyi Wang[2,3]
[1]Hong Kong University of Science and Technology, HONG KONG, [2]Beijing Institute of Technology, CHINA, and [3]BIT Chongqing Institute of Microelectronics and Microsystems, CHINA

W342-f **A THERMAL AIRFLOW SENSOR BASED ON MN-CO-NI-O THIN FILM**
Jie Wang, Yunfei Liu, Zhezheng Zhu, Chengchen Gao, Zhenchuan Yang, and Yilong Hao
Peking University, CHINA

M143-f **HIGHLY SENSITIVE WAVE HEIGHT SENSOR WITH MEMS PIEZORESISTIVE CANTILEVER AND WATERPROOF MEMBRANE**
Takuto Hirayama and Hidetoshi Takahashi
Keio University, JAPAN

T243-f **MEMS CAPACITANCE DIAPHRAGM GAUGE WITH TWO SEALED REFERENCE CAVITIES**
Xiaodong Han[1,2], Jingzhen Li[3], Gang Li[4], and Yongjian Feng[1]
[1]Xiamen University, CHINA, [2]University of Twente, NETHERLANDS,
[3]Beijing University of Technology, CHINA, and [4]Lanzhou Institute of Physics, CHINA

W343-f **TOWARDS A GAS INDEPENDENT THERMAL FLOW METER**
Shirin Azadi Keari[1], Remco J. Wiegerink[1], Remco G.P. Sanders[1], and Joost C. Lotters[1,2]
[1]University of Twente, NETHERLANDS and [2]Bronkhorst High-Tech BV, NETHERLANDS

f - MEMS Physical and Chemical Sensors
Force & Displacement Sensors

M144-f **AN INTEGRATED MEMS DEVICE FOR *IN-SITU* FOUR-PROBE ELECTRO-MECHANICAL CHARACTERIZATION OF PT NANOBEAM**
Yuheng Huang, Meng Nie, Binghui Li, Kuibo Yin, and Litao Sun
Southeast University, CHINA

T244-f **FINGERLIKE TACTILE TEXTURE INTEGRATED SENSOR WITH COLD AND WARM SENSATIONS OF SUB-MM SPATIAL RESOLUTION**
Nachi Mise, Mitsuki Kozasa, Kyohei Terao, Fusao Shimokawa, and Hidekuni Takao
Kagawa University, JAPAN

W344-f **MODIFIED BEAM STRUCTURES FOR IMPROVED RESONANT SENSING**
Erfan Ghaderi and Behraad Bahreyni
Simon Fraser University, CANADA

M145-f **OCCLUSAL PAPER-BASED FLEXIBLE PRESSURE SENSOR FOR IN SITU MEASURING ORAL OCCLUSAL FORCE**
Wenduo Wang, Xin Zhang, Ning Zhao, Jingquan Liu, and Bin Yang
Shanghai Jiao Tong University, CHINA

T245-f **SUCTION CUP ARRAY WORKING ALSO AS TACTILE SENSOR TO DETECT CUPS DEFORMATION USING KCF AND CNN**
Toshihiro Shiratori, Jinya Sakamoto, Yuki Kumokita, Masato Suzuki, Tomokazu Takahashi, and Seiji Aoyagi
Kansai University, JAPAN

W345-f **VERTICAL INTEGRATION OF FORCE TRANSMISSION STRUCTURE ON CAPACITIVE CMOS-MEMS TACTILE FORCE SENSOR FOR SENSITIVITY IMPROVEMENT**
Yuanyuan Huang, Yen-Lin Chen, Shihwei Lin, Fuchi Shih, Zihsong Hu, and Weileun Fang
National Tsing Hua University, TAIWAN

f - MEMS Physical and Chemical Sensors
Gas & Chemical Sensors

M146-f **1-OCTADECANETHIOL SAM ON CMOS-MEMS GOLD PLATED RESONATOR VIA DIP-CAST FOR VOCs SENSING**
Rafel Perelló-Roig[1,2], Jaume Verd[1,2], Sebastià Bota[1,2],
Bartomeu Soberats[1], Antonio Costa[1], and Jaume Segura[1,2]
[1]University of the Balearic Islands, SPAIN and [2]Health Research Institute of the Balearic Islands, SPAIN

T246-f **APPLICATION OF DEEP LEARNING NETWORK FOR HUMIDITY COMPENSATION OF SEMICONDUCTOR METAL OXIDE GAS SENSORS**
Mingu Kang, Incheol Cho, and Inkyu Park
Korea Advanced Institute of Science and Technology (KAIST), KOREA

W346-f **DEVELOPMENT OF MONOLITHIC MICRO-LED GAS SENSOR BASED E-NOSE SYSTEM FOR REAL-TIME, SELECTIVE GAS PREDICTION**
Kichul Lee, Mingu Kang, and Inkyu Park
Korea Advanced Institute of Science and Technology (KAIST), KOREA

M147-f **ELECTRONIC-NOSE: AN ARRAY OF 16 MOS-GAS SENSORS INTEGRATED WITH TEMPERATURE AND MOISTURE SENSING CAPABILITIES**
Xiawei Yue[1,2], Shuai Wei[1,2], Pingping Zhang[3], Zhitao Zhou[1], Tiger Tao[1,2,4,5,6], and Nan Qin[1]
[1]Chinese Academy of Sciences (CAS), CHINA, [2]University of Chinese Academy of Sciences, CHINA, [3]Suzhou Huiwen Nanotechnology Co. Ltd., CHINA, [4]ShanghaiTech University, CHINA, [5]Shanghai Research Center for Brain Science and Brain-Inspired Intelligence, CHINA and [6]Neuroxess Co., Ltd. (Jiangxi), CHINA

T247-f **ENHANCEMENT OF SENSITIVITY IN PHOTONIC CRYSTAL BASED CHEMICAL SENSOR USING CHEMO-MECHANICAL BILAYER EFFECT**
Seyeon Lee[1], Naik T. Banabathi[1], Dongwon Kang[3], Sookyung Kang[2],
Kyungsuk Cho[2], Jungwook Kim[1], and Jungyul Park[1]
[1]Sogang University, KOREA, [2]Iwha University, KOREA, and [3]University of California, Los Angeles, USA

W347-f **METAL ION RECOGNITION SENSOR BASED ON RESISTANCE SWITCHING EFFECT**
Tian Kang, Yusa Chen, Guanzhou Lin, Shengxiao Jin,
Liye Li, Hongshun Sun, Senyong Hu, and Wengang Wu
Peking University, CHINA

M148-f **MULTI-HOTSPOT MID-IR NANOANTENNAS WITH MATCHED LOSS AND HIGH-INTENSITY NEAR-FIELD FOR SUB-PPM-LEVEL GAS DETECTION**
Hong Zhou, Zhihao Ren, Cheng Xu, Liangge Xu, Xinge Guo, and Chengkuo Lee
National University of Singapore, SINGAPORE

T248-f **PALLADIUM BASED MEMS HYDROGEN SENSORS**
Max Hoffmann[1], Marion Wienecke[1], Maren Lengert[2], Michael H. Weidner[2], and Jan Heeg[2]
[1]Hochschule Wismar, Institut für Oberflächen- und Dünnschichttechnik, GERMANY and [2]Materion GmbH, GERMANY

W348-f **SELECTIVE DISCRIMINATION OF PPB-LEVEL VOCS USING MOS GAS SENSOR IN PULSE-HEATING MODE WITH THE MODIFIED HILL'S MODEL**
Gaoqiang Niu, Yi Zhuang, Yushen Hu, Zong Liu, and Fei Wang
Southern University of Science and Technology, CHINA

M149-f **THERMAL CONDUCTIVITY DETECTOR (TCD)-TYPE GAS SENSOR BASED ON THE SUSPENDED 1D NANOHEATER FOR IOT APPLICATIONS**
Wootaek Cho, Jong-Hyun Kwak, Taejung Kim, and Heungjoo Shin
Ulsan National Institute of Science and Technology (UNIST), KOREA

f - MEMS Physical and Chemical Sensors

Inertial Sensors

T249-f **120 PPM QUALITY FACTOR THERMAL STABILITY FROM -40°C TO +60°C OF A DUAL-AXIS MEMS GYROSCOPE BASED ON JOULE EFFECT DYNAMIC CONTROL**
Jian Cui[1,2] and Qiancheng Zhao[1,2]
[1]Peking University, CHINA and [2]Beijing Advanced Innovation Center for Integrated Circuits, CHINA

W349-f **A FORCE-BANLANCE CAPACITIVE MEMS GRAVIMETER WITH SUPERIOR RESPONSE TIME, SELF-NOISE AND DRIFT**
Le Gao[1], Fangzheng Li[1], Jian Zhang[1], Bingyang Cai[1], Wenjie Wu[1], and Liangcheng Tu[2]
[1]Huazhong University of Science and Technology, CHINA and [2]Sun Yat-sen University, CHINA

M150-f **A MEMS-BASED GRAVIMETER FOR SIMULTANEOUS VERTICAL AND HORIZONTAL EARTH TIDES MEASUREMENTS**
Lujia Yang[1], Xiaochao Xu[1], Qian Wang[1], Ji'ao Tian[1], Yanyan Fang[1],
Chun Zhao[1], Wenjie Wu[1], Fangjing Hu[1], and Liangcheng Tu[1,2]
[1]Huazhong University of Science and Technology, CHINA and [2]Sun Yat-sen University (Zhuhai Campus), CHINA

T250-f **A NOVEL MULTIPLE FOLDED BEAM DISK RESONATOR FOR MAXIMIZING THE THERMOELASTIC QUALITY FACTOR**
Xiaopeng Sun[1], Xin Zhou[1], Lei Yu[2], Kaixuan He[2], Xuezhong Wu[1], and Dingbang Xiao[1]
[1]National University of Defense Technology, CHINA and
[2]East China Institute of Photo-Electronic IC, CHINA

W350-f **A TIME-SERIES CONFIGURATION METHOD OF MODE REVERSAL MEMS GYROSCOPES UNDER DIFFERENT TEMPERATURE-VARYING CONDITIONS**
Liangqian Chen, Tongqiao Miao, Qingsong Li, Peng Wang, Junjian Li,
Xuezhong Wu, Dingbang Xiao, and Xiang Xi
National University of Defense Technology, CHINA

M151-f **ACOUSTICALLY ISOLATED MEMS BAW GYROSCOPES**
Diego Emilio Serrano, Amir Rahafrooz, Duane Younkin, Kieran Nunan,
Mitul Dalal, Sagnik Pal, and Ijaz Jafri
Panasonic Device Solutions Laboratory of Massachusetts, USA

T251-f **ACTIVE QUALITY FACTOR STABILIZATION OF MEMS RESONATOR UTILIZING ELECTRICAL DISSIPATION REGULATION**
Yang Zhao, Qin Shi, Guoming Xia, and Anping Qiu
Nanjing University of Science and Technology, CHINA

W351-f **DEMONSTRATION OF GYRO-LESS NORTH FINDING USING A T-SHAPED MEMS DIFFERENTIAL RESONANT ACCELEROMETER**
Kei Masunishi, Etsuji Ogawa, Daiki Ono, Fumito Miyazaki, Hiroki Hiraga,
Kengo Uchida, Jumpei Ogawa, Hideaki Murase, and Yasushi Tomizawa
Toshiba Corporation, JAPAN

M152-f **ENHANCED STIFFNESS SENSITIVITY IN A MODE LOCALIZED SENSOR USING INTERNAL RESONANCE ACTUATION**
Jianlin Chen[1], Hemin Zhang[2], Takashiro Tsukamoto[1], Michael Kraft[2], and Shuji Tanaka[1]
[1]Tohoku University, JAPAN and [2]KU Leuven, BELGIUM

T252-f **MODELING STRESS EFFECTS ON FREQUENCIES OF A MEMS RING GYROSCOPE**
Mehran Hosseini-Pishrobat, Baha Erim Uzunoglu, and Erdinc Tatar
Bilkent University, TURKEY

W352-f **RATE INTEGRATING GYROSCOPE TUNED BY FOCUS ION BEAM TRIMMING AND INDEPENDENT CW/CCW MODES CONTROL**
Jianlin Chen[1], Takashiro Tsukamoto[1], Giacomo Langfelder[2], and Shuji Tanaka[1]
[1]Tohoku University, JAPAN and [2]Politecnico di Milano, ITALY

M153-f **TEMPERATURE DEPENDENCE OF QUALITY FACTORS AT HIGH FREQUENCIES IN MEMS GYROSCOPES**
Daniel Schiwietz[1,2], Eva M. Weig[2], and Peter Degenfeld-Schonburg[1]
[1]Robert Bosch GmbH, GERMANY and [2]Technical University of Munich, GERMANY

f - MEMS Physical and Chemical Sensors
Manufacturing Techniques for Physical Sensors

T253-f **0.5MM×0.5MM 150KPA-MEASURE-RANGE HIGH-TEMPERATURE PRESSURE SENSOR WITH HIGH-PERFORMANCE AND LOW FABRICATION-COST**
Peng Li[1,2], Wei Li[1], Changnan Chen[1,3], Ke Sun[1], Min Liu[1], Sheng Wu[1],
Pichao Pan[1,3], Jiachou Wang[1,3], and Xinxin Li[1,2,3]
[1]Chinese Academy of Sciences, CHINA, [2]Fudan University, CHINA, and
[3]University of Chinese Academy of Sciences, CHINA

W353-f **AUTOMATIC PICO LASER TRIMMING SYSTEM FOR SILICON MEMS RESONANT DEVICES BASED ON IMAGE RECOGNITION**
Yuxian Liu[1], Qiancheng Zhao[1,2], Dacheng Zhang[1], and Jian Cui[1,2]
[1]Peking University, CHINA and [2]Beijing Advanced Innovation Center for Integrated Circuits, CHINA

M154-f **MICROMACHINING FUSED SILICA MICRO SHELL RESONATOR WITH QUARTZ GLASS MOLD BY THERMAL REFLOW**
Zhaoxi Su, Bin Luo, Qiankai Tang, Linqian Zhu, and Jintang Shang
Southeast University, CHINA

T254-f **WAFER-LEVEL PATTERNING OF TIN OXIDE NANOSHEETS FOR MEMS GAS SENSORS**
Mingjie Li, Wenxin Luo, Xiaojiang Liu, Gaoqiang Niu, and Fei Wang
Southern University of Science and Technology, CHINA

f - MEMS Physical and Chemical Sensors
Materials for Physical Sensors

W354-f **AIR DAMPING EFFECTS ON DIFFERENT MODES OF AlN-on-Si MICROELECTROMECHANICAL RESONATORS**
Yuncong Liu[1], S M Enamul Hoque Yousuf[1], Afzaal Qamar[2], Mina Rais-Zadeh[2,3], and Philip X.-L. Feng[1]
[1]University of Florida, USA, [2]University of Michigan, USA, and [3]California Institute of Technology, USA

M155-f **A NOVEL PIEZORESISTIVE PRESSURE SENSOR BASED ON CR-DOPED V_2O_3 THIN FILM**
Michiel Gidts, Wei-Fan Hsu, María Recaman Payo, Shashwat Kushwaha, Chen Wang,
Frederik Ceyssens, Dominiek Reynaerts, Jean-Pierre Locquet, and Michael Kraft
KU Leuven, BELGIUM

f - MEMS Physical and Chemical Sensors
Metrology and Measurement Techniques for MEMS/NEMS Sensors

T255-f **A NOVEL FEEDTHROUGH CANCELLATION TECHNIQUE FOR PIEZOELECTRIC MEMS RESONANT SENSORS IN IONIC LIQUID MEDIUM**
Cheng-Yen Wu, Zhong-Wei Lin, and Sheng-Shian Li
National Tsing Hua University, TAIWAN

W355-f **CHARACTERIZATION OF PACKAGING STRESS WITH A CAPACITIVE STRESS SENSOR ARRAY**
Tolga Veske[1], Derin Erkan[1], and Erdinc Tatar[1,2]
[1]Bilkent University, TURKEY and [2]The National Nanotechnology Research Center (UNAM), TURKEY

M156-f **MILLISECOND-LEVEL PULSE-HEATING SENSING SYSTEM FOR MEMS-BASED GAS SENSORS**
Yi Zhuang, Gaoqiang Niu, Lang Wu, and Fei Wang
Southern University of Science and Technology, CHINA

T256-f **MULTIPLE PARAMETER DECOUPLING USING A SINGLE RESONANT MEMS SENSOR VIA BLUE SIDEBAND EXCITATION**
Jingqian Xi[1], Lei Xu[1], Yuan Wang[2], Fangjing Hu[1], Chengxin Li[4], Linlin Wang[4], Huafeng Liu[1], Chen Wang[4], Michael Kraft[4], and Chun Zhao[3]
[1]Huazhong University of Science and Technology, CHINA, [2]University of Macau, CHINA, [3]University of York, UK, and [4]University Leuven, BELGIUM

f - MEMS Physical and Chemical Sensors
Nanoscale Physical Sensors

W356-f **DIAMOND NANOWIRES ARRAY PREPARED BY ANNEALING NANO-CRYSTALLINE DIAMOND IN AIR AND ITS APPLICATION IN FIELD EMISSION**
Yang Wang, Chen Lin, and Jinwen Zhang
Peking University, CHINA

M157-f **QUANTIFIED STRESS RELAXATION IN CARBON NANOTUBE RESONATORS**
Morten Vollmann, Cosmin Roman, Miroslav Haluska, and Christofer Hierold
ETH Zürich, SWITZERLAND

T257-f **SELF-REFERENCED TEMPERATURE SENSORS BASED ON CASCADED SILICON RING RESONATOR**
Xiantao Zhu, Minmin You, Zude Lin, Bin Yang, and Jingquan Liu
Shanghai Jiao Tong University, CHINA

f - MEMS Physical and Chemical Sensors
Sonic & Ultrasonic MEMS Transducers

W357-f **A 0.35 mm^2 SYSTEM ON CHIP LEVEL DETECTOR BASED ON AN ANNULAR PMUT-ON-CMOS ARRAY**
Eyglis Ledesma, Iván Zamora, Francesc Torres, Arantxa Uranga, and Núria Barniol
Universitat Autònoma de Barcelona, SPAIN

M158-f **AN ALSCN PMUT-ON-CMOS SENSOR FOR MONITORING FLUIDS' DENSITY, VISCOSITY, SOUND VELOCITY, AND COMPRESSIBILITY**
Eyglis Ledesma, Iván Zamora, Jesús Yanez, Arantxa Uranga, and Núria Barniol
Universitat Autònoma de Barcelona, SPAIN

T258-f **AUTO-POSITIONING AND HAPTIC STIMULATIONS VIA A 35 MM SQUARE PMUT ARRAY**
Wei Yue[1], Yande Peng[1], Hanxiao Liu[1], Fan Xia[1], Fanping Sui[1], Seiji Umezawa[2], Shinsuke Ikeuchi[2], Yasuhiro Aida[2], and Liwei Lin[1]
[1]University of California, Berkeley, USA and [2]Murata Manufacturing Co., Ltd., JAPAN

W358-f **BODY FORCE BASED DROPLET EJECTION BY GHZ ACOUSTIC MICRO-TRANSDUCER**
Haitao Zhang, Yangchao Zhou, Menglun Zhang, Wenlan Guo, Chen Sun, Xuexin Duan, and Wei Pang
Tianjin University, CHINA

M159-f **BONE CONDUCTION PICKUP BASED ON PIEZOELECTRIC MICROMACHINED ULTRASONIC TRANSDUCERS**
Chongbin Liu[1], Xiangyang Wang[1], Yong Xie[2], and Guoqiang Wu[1]
[1]Wuhan University, CHINA and [2]Xidian University, CHINA

T259-f **BREAKING THE DEAD ZONE LIMITATION OF PMUTS BASED ON A PHASE SHIFT OF DRIVING WAVEFORM WITH WINDOW FUNCTION**
Chun-You Liu, Chin-Yu Chang, and Sheng-Shian Li
National Tsing Hua University, TAIWAN

W359-f **DRONE-MOUNTED LOW-FREQUENCY PMUTS FOR > 6-METER RANGEFINDER IN AIR**
Hanxiao Liu[1], Yande Peng[1], Wei Yue[1], Seiji Umezawa[2], Shinsuke Ikeuchi[2], Yasuhiro Aida[2], Chunming Chen[1], Peggy Tsao[1], and Liwei Lin[1]
[1]University of California, Berkeley, USA and [2]Murata Manufacturing Co., Ltd., JAPAN

M160-f **MASS PRODUCED MICROMACHINED ULTRASONIC TIME-OF-FLIGHT SENSORS OPERATING IN DIFFERENT FREQUENCY BANDS**
Richard J. Przybyla[1], Stefon E. Shelton[1], Cathy Lee[1], Ben Eovino[1], Quy Chau[1], Mitchell H. Kline[1], Oleg I. Izyumin[1], and David A. Horsley[1,2]
[1]TDK Invensense, USA and [2]University of California, Davis, USA

T260-f **MEMS FIRST-ORDER BESSEL BEAM ACOUSTIC TRANSDUCER FOR PARTICLE TRAPPING AND CONTROLLABLE ROTATING**
Jiaqi Li[1], Zhenhuan Sun[1], Yuyu Jia[1], Teng Li[1], Haojian Lu[2], Lurui Zhao[3], Hai Liu[3], and Song Liu[1]
[1]ShanghaiTech University, CHINA, [2]Zhejiang University, CHINA, and [3]University of Southern California, Los Angeles, USA

W360-f **NON-INVASIVE CAROTID ARTERY MONITORING BY USING ALUMINUM NITRIDE PMUT CLOSE-PACKED ARRAYS**
Sheng Wu[1,2,3], Kangfu Liu[2], Shuai Shao[2], Wei Li[1,3], Ying Chen[1,3], Tao Wu[2], and Xinxin Li[1,3]
[1]Chinese Academy of Sciences, CHINA, [2]ShanghaiTech University, CHINA, and [3]University of Chinese Academy of Sciences, CHINA

M161-f **NON-LINEAR BEHAVIORAL MODELING OF CAPACITIVE MEMS MICROPHONES**
Sebastian Anzinger[1,2], Hutomo Suryo Wasisto[1], Abhiraj Basavanna[1], and Alfons Dehé[2,3]
[1]Infineon Technologies AG, GERMANY, [2]University of Freiburg, GERMANY, and [2]Hahn-Schickard-Gesellschaft, GERMANY

T261-f **VORTEX-BEAM ACOUSTIC TRANSDUCER FOR UNDERWATER PROPULSION**
Jaehoon Lee, Kianoush Sadeghian Esfahani, and Eun S. Kim
University of Southern California, USA

W361-f **WIDEBAND AND HIGHLY SENSITIVE MICROMACHINED PZT FILM-BASED ULTRASONIC MICROPHONE WITH PARYLENE FILM AND FLEXIBLE HELMHOLTZ RESONATOR ENHANCEMENT**
Chung-Hao Huang and Guo-Hua Feng
National Tsing Hua University, TAIWAN

f - MEMS Physical and Chemical Sensors

Other Physical Sensors

M162-f **HALBACH-ARRAY MAGNETIC COIL ARRANGEMENT ON CMOS CHIP FOR SENSITIVITY ENHANCEMENT OF INDUCTIVE TACTILE SENSOR**
Tien Chou, Zih-Song Hu, and Weileun Fang
National Tsing Hua University, TAIWAN

T262-f ***ON-MEMS-CHIP* COMPACT TEMPERATURE SENSOR FOR LARGE-VOLUME, LOW-COST SENSOR CALIBRATION**
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

W362-f **PARTICULATE MATTER SENSOR BASED ON TWO STAGE CASCADE VIRTUAL IMPACTORS AND THERMOPHORETIC MICROHEATERS**
Kwang-Wook Choi[1], Ilhwan Kim[1], Seokwhan Chung[1], Gi-Bong Sung[2], and Se-Jin Yook[2]
[1]Samsung Advanced Institute of Technology, KOREA and [2]Hanyang University, KOREA

g – Micro- and Nanofluidics
Biological and Medical Microfluidics and Nanofluidics

M163-g **A MICROFLUIDIC OXYGEN GRADIENT GENERATOR FOR THE STUDY OF AEROTROPISM IN HYPHAE OF OOMYCETES**
Ayelen Tayagui[1,2], Yiling Sun[1,2], Ashley Garrill[1], and Volker Nock[1,2]
[1]University of Canterbury, NEW ZEALAND and
[2]MacDiarmid Institute for Advanced Materials and Nanotechnology, NEW ZEALAND

T263-g **A PAPER-BASED DUAL APTAMER ASSAY ON AN INTEGRATED MICROFLUIDIC SYSTEM FOR DETECTION OF HNP 1 AS A BIOMARKER FOR PERIPROSTHETIC JOINT INFECTIONS**
Rishabh Gandotra[1], Feng-Chih Kuo[2], Mel S. Lee[3], and Gwo-Bin Lee[1]
[1]National Tsing Hua University, TAIWAN, [2]Kaohsiung Chang Gung Memorial Hospital, TAIWAN, and [3]Paochien Hospital, TAIWAN

W363-g **AN INTEGRATED MICROFLUIDIC PLATFORM FOR TUMOR CELL SEPARATION AND FLUORESCENCE IN SITU HYBRIDIZATION AT SINGLE CELL LEVEL**
Shihui Qiu[1,2], Na Li[1,2], Zhenhua Wu[1,2], Jianlong Zhao[1,2], and Hongju Mao[1,2]
[1]Chinese Academy of Science, CHINA and [2]University of Chinese Academy of Sciences, CHINA

M164-g **CHARACTERIZATION OF OOCYTE HARDENING USING A MICROFLUIDIC ASPIRATION-ASSISTED ELECTRICAL IMPEDANCE SPECTROSCOPY SYSTEM**
Yuan Cao, Julia Floehr, and Uwe Schnakenberg
RWTH Aachen University, GERMANY

T264-g **DOUBLE PULSE IRRADIATION OF FS LASER FOR ENHANCING THE PERFORMANCE OF PRECISE LASER SORTING METHOD**
Ryota Kiya[1], Yoshinaga Rintaro[1], Yo Tanaka[2], Yaxiaer Yalikun[1,2], and Yoichiroh Hosokawa[1]
[1]Nara Institute of Science and Technology, JAPAN and
[2]Institute of Physical and Chemical Research (RIKEN), JAPAN

W364-g **DROPLET BASED HIGH THROUGHPUT SINGLE-SPERM CRYOPRESERVATION PLATFORM**
Na Li[1,2], Shihui Qiu[1,3], Zhenhua Wu[1,3], and Hongju Mao[1,3]
[1]Chinese Academy of Sciences, CHINA, [2]ShanghaiTech University, CHINA, and
[3]University of Chinese Academy of Sciences, CHINA

M165-g **DUAL ION-SELECTIVE MEMBRANE DEPOSITED ION-SENSITIVE FIELD-EFFECT TRANSISTOR (DISM-ISFET) INTEGRATING WHOLE BLOOD PROCESSING MICROCHAMBER FOR IN SITU BLOOD ION TESTING**
Xiao-Wen Chen, Syuan-Rong Huang, and Nien-Tsu Huang
National Taiwan University, TAIWAN

g – Micro- and Nanofluidics
Generic Microfluidics & Nanofluidics

W365-g **STRONG MICROSTREAMING FROM A PINNED OSCILLATING MEMBRANE AND APPLICATION TO GAS EXCHANGE**
Anthony L. Mercader and Sung Kwon Cho
University of Pittsburgh, USA

M166-g **TUNABLE NANOPORE-INTEGRATED MICRO-/NANOFLUIDIC PLATFORM FOR ION TRANSPORT CONTROL IN THE PRESENCE OF CONCENTRATION AND TEMPERATURE GRADIENTS**
Dongwoo Seo[1], Dongjun Kim[1], Jongwan Lee[1], Cong Wang[2], Jungyul Park[2], and Taesung Kim[1]
[1]Ulsan National Institute of Science and Technology (UNIST), KOREA and [2]Sogang University, KOREA

g – Micro- and Nanofluidics
Integrated/Embedded Microfluidics and Nanofluidic Systems & Platforms

W366-g **QUANTITATIVE ASSESSMENT OF CAPTURED MAGNETIC NANOPARTICLES USING SELF-POWERED MAGNETOELECTRIC PLATFORM FOR BIOLOGICAL APPLICATIONS**
Pankaj Pathak, Vinit K. Yadav, Samaresh Das, and Dhiman Mallick
Indian Institute Of Technology Delhi, INDIA

M167-g **REAL-TIME OPERATION OF MICROCANTILEVER-BASED IN-PLANE RESONATORS PARTIALLY IMMERSED IN A MICROFLUIDIC SAMPLER**
Jiushuai Xu, Entian Cao, Michael Fahrbach, Vladislav Agluschewitsch, Andreas Waag, and Erwin Peiner
Technische Universität Braunschweig, GERMANY

T267-g **SUSPENDED NANOCHANNEL RESONATORS MADE BY NANOIMPRINT AND GAS PHASE DEPOSITION**
Manuel Müller[1], Jeremy Teuber[1], Rukan Nasri[1], Francesc Torres Canals[2], Núria Barniol[2], Jordi Llobet Sixto[3], Xavier Borrise[3], Francesc Perez-Murano[3], and Irene Fernandez-Cuesta[1]
[1]University of Hamburg, GERMANY, [2]Universitat Autónoma de Barcelona, SPAIN, and [3]IMB-CNM CSIC, SPAIN

g – Micro- and Nanofluidics
Manufacturing for Micro- and Nanofluidics

W367-g **DEVELOPING AN EXTREMELY HIGH FLOW RATE PNEUMATIC PERISTALTIC MICROPUMP FOR BLOOD PLASMA SEPARATION WITH INERTIAL PARTICLE FOCUSING TECHNIQUE FROM FINGERTIP BLOOD WITH LANCETS**
Tuan N.A. Vo[1,2,3], Pin-Chuan Chen[1], and Pai-Shan Chen[4]
[1]National Taiwan University of Science and Technology, TAIWAN, [2]Ho Chi Minh City University of Technology (HCMUT), VIETNAM, [3]Vietnam National University, VIETNAM, and [4]National Taiwan University, TAIWAN

M168-g **DIRECT PATTERNING ON POROUS SURFACE USING DROP IMPACT PRINTING**
Bheema Sankar Reddy[1], Chandantaru Dey Modak[1,2], Rutvik Lathia[1], Bhawana Agarwal[1,3], Ebinesh Abraham R[1], and Prosenjit Sen[1]
[1]Indian Institute of Science, Bangalore, INDIA, [2]CNRS - ESPCI PSL, France, and [3]Johns Hopkins University, USA

T268-g **MANUFACTURING 3D-PRINTED PAPER MICROFLUIDICS INTEGRATED WITH IONIZATION MASS-SPECTROMETRY FOR ILLICIT DRUGS ANALYSIS AND ON-CHIP CHROMATOGRAPHY**
Muhammad Faizul Zaki[1], Pin-Chuan Chen[1], Yi-Xin Wu[2], and Pai-Shan Chen[2]
[1]National Taiwan University of Science and Technology, TAIWAN and [2]National Taiwan University, TAIWAN

g – Micro- and Nanofluidics
Materials for Micro & Microfluidics

W368-g **DETECTION LIMITS IN NANOMECHANICAL MASS FLOW SENSING FOR NANOFLUIDICS WITH NANOWIRE OPEN CHANNELS**
Javier E. Escobar, Juan Molina, Eduardo Gil-Santos, José J. Ruz, Óscar Malvar, Priscila M. Kosaka, Javier Tamayo, Álvaro San Paulo, and Montserrat Calleja
Instituto de Micro y Nanotecnología, IMN-CNM (CSIC), SPAIN

g – Micro- and Nanofluidics
Modeling of Micro & Nanofluidics

M169-g **CONTROLLING PARTICLE AGGREGATION AND SEPARATION IN LIQUID ON MEMBRANE RESONATORS**
Haoran Zhang[1,2], Hao Jia[1,2], and Xinxin Li[1,2]
[1]Chinese Academy of Sciences, CHINA and [2]University of Chinese Academy of Sciences, CHINA

T269-g **DEVELOPMENT OF BOAT MODEL POWERED BY ELECTRO-HYDRODYNAMIC PROPULSION SYSTEM**
Luan Ngoc Mai[1,2], Tuan-Khoa Nguyen[3], Trung Hieu Vu[3], Thien Xuan Dinh[4], Canh-Dung Tran[5], Hoang-Phuong Phan[6], Toan Dinh[5], Thanh Nguyen[5], Nam-Trung Nguyen[3], Dzung Viet Dao[3], and Van Thanh Dau[3]
[1]Ho Chi Minh City University of Technology, VIETNAM, [2]Vietnam National University Ho Chi Minh City, VIETNAM, [3]Griffith University, AUSTRALIA, [4]Explosion Research Institute Inc., JAPAN, [5]University of Southern Queensland, AUSTRALIA, and [6]University of New South Wales, AUSTRALIA

W369-g **HEMODYNAMIC ANALYSIS OF CARDIOMEMS: ADVERSE HEMODYNAMIC EFFECTS**
Zhenhao Liu[1], Jiangli Han[2], and Xing Chen[1]
[1]Beihang University, CHINA and [2]Peking University Third Hospital, CHINA

M170-g **MODAL QUALITY FACTOR INVERSION OF NON-SLENDER MEMS RESONATORS BETWEEN GASES AND LIQUIDS**
Andre L. Gesing, Thomas Tran, Daniel Platz, and Ulrich Schmid
TU Wien, AUSTRIA

g – Micro- and Nanofluidics
Other Micro- and Nanofluidics

T270-g **CLASSIFYING CELL CYCLE BY ELECTRICAL PROPERTIES USING MACHINE LEARNING**
Jian Wei and Xiaoxing Xing
Beijing University of Chemical Technology, CHINA

W370-g **HIGH-THROUGHPUT SPHERICAL SUPRAPARTICLE SELF-ASSEMBLY BY ENHANCED EVAPORATION OF COLLOIDAL WATER DROPLETS THROUGH THIN FILM OF WATER-SOLUBLE OIL**
Wonhyung Lee, Joowon Rhee, and Joonwon Kim
Pohang University of Science and Technology (POSTECH), KOREA

M171-g **IN-ICE POLYMERIZATION FOR FUNCTIONAL HYDROGEL MICROBEAD WITH FLASH FREEZING CENTRIFUGAL MICROFLUIDIC DEVICE**
Tomomi Murayama[1], Koki Yoshida[1], Yuta Kurashina[2], and Hiroaki Onoe[1]
[1]Keio University, JAPAN and [2]Tokyo University of Agriculture and Technology, JAPAN

T271-g **TEMPERATURE-RESPONSIVE MICROCAPSULES MANUFACTURED BY PROMOTING CONTROLLED CLOAKING WITH THE HELP OF MICRO/NANOPARTICLES**
Rutvik Lathia[1], Bheema Sankar Reddy[1], Chandantaru Dey Modak[1,2], Satchit Nagpal[1,3], and Prosenjit Sen[1]
[1]Indian Institute of Science, INDIA, [2]CNRS - ESPCI PSL, FRANCE, and [3]Texas A&M University, USA

W371-g **WATER VITRIFICATION IN A MICROCHANNEL AT LOW COOLING RATE**
Ayane Sato, Tomohiro Hayashi, and Tadashi Ishida
Tokyo Institute of Technology, JAPAN

h - Optical, RF and Electromagnetics for MEMS/NEMS
Electrical Field and Magnetic Field Sensors and Transducers

M172-h **A HIGHLY SENSITIVE 3-AXIS MICRO SEARCH-COIL MAGNETOMETER ENABLED BY HIGH DENSITY THROUGH-SILICON-VIA PROCESS**
Hadi Tavakkoli, Mingzheng Duan, Longheng Qi, Izhar, Xu Zhao, and Yi-Kuen Lee
Hong Kong University of Science and Technology, HONG KONG

T272-h **FULLY INTEGRATED BACK-BIASED 3D HALL SENSOR WITH WAFER-LEVEL INTEGRATED PERMANENT MICROMAGNETS**
Björn Gojdka[1], Daniel Cichon[2], Markus Stahl-Offergeld[2], Dominik Schröder[3],
Niels Clausen[1], Christian Hedayat[3], Hans-Peter Hohe[2], and Thomas Lisec[1]
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h - Optical, RF and Electromagnetics for MEMS/NEMS
Free Space Optical Components & Systems

W372-h **A LARGE-STROKE TIP-TILT-PISTON MICROMIRROR WITH ELECTROMAGNETIC ACTUATORS BASED ON METALLIC GLASS**
Chuan-Hui Ou, Nguyen V. Toan, and Takahito Ono
Tohoku University, JAPAN

M173-h **ARBITRARY SHAPED BACKSIDE REINFORCEMENT FOR TWO DIMENSIONAL RESONANT MICROMIRRORS**
Takashi Sasaki, Adrien Piot, Anton Lagosh, Clement Fleury, Markus Bainschab, Yanfen Zhai,
Marcus Baumgart, Sara Guerreiro, Dominik Holzmann, Aleš Travnik, and Mohssen Moridi
Silicon Austria Labs, AUSTRIA

T273-h **HIGH TRANSMITTANCE METASURFACE HOLOGRAMS USING SILICON NITRIDE**
Masakazu Yamaguchi, Hiroki Saito, Satoshi Ikezawa, and Kentaro Iwami
Tokyo University of Agriculture and Technology, JAPAN

W373-h **MULTIFUNCTIONAL OPTICAL METASURFACE FOR ANOMALOUS REFLECTION, STRUCTURAL COLOR, AND SURFACE LATTICE RESONANCE**
Liye Li[1], Hongshun Sun[1], Yifan Ouyang[1], Shengxiao Jin[1], Tian Kang[1], Zhimei Qi[2], and Wengang Wu[1]
[1]Peking University, CHINA and [2]Chinese Academy of Science, CHINA

M174-h **NOVEL WAVEFRONT-SPLITTING INTERFEROMETER FOR ULTRA-COMPACT BROADBAND FT-IR SPECTROSCOPY EXTENDING TO VISIBLE RANGE**
Bassem Mortada[1], Yasser M. Sabry[1,2], Bassam Saadany[1], Tarik Bourouina[3], and Diaa Khalil[2]
[1]Si-Ware Systems, EGYPT, [2]Ain Shams University, EGYPT, and [3]Université Gustave Eiffel, FRANCE

T274-h **PIEZOELECTRICALLY ACTUATED MICROMIRROR WITH DYNAMIC DEFORMATION COMPENSATION MECHANISM**
Takashi Sasaki, Adrien Piot, Jaka Pribošek, Anton Lagosh, Clement Fleury, Markus Bainschab, Yanfen Zhai,
Marcus Baumgart, Sara Guerreiro, Dominik Holzmann, Aleš Travnik, and Mohssen Moridi
Silicon Austria Labs, AUSTRIA

W374-h **RESONANT d_{33} MODE PZT MEMS MIRROR EXCITED WITH DIRECTIONAL INTERDIGITATED ELECTRODES**
Pooja Thakkar, Anton Lagosh, Takashi Sasaki, Markus Bainschab, and Jaka Pribošek
Silicon Austria Labs GmbH, AUSTRIA

M175-h **RESONANT PIEZOELECTRIC VARIFOCAL MIRROR WITH ON-CHIP INTEGRATED DIFFRACTIVE OPTICS FOR INCREASED FREQUENCY RESPONSE**
Jaka Pribošek, Anton Lagosh, Pooja Thakkar, Takashi Sasaki, and Markus Bainschab
Silicon Austria Labs, AUSTRIA

T275-h **UNIQUE DISPERSION RELATION FOR PLASMONIC PHOTODETECTORS WITH SUBMICRON GRATING**
Yuki Kaneda[1], Masaaki Oshita[1], Utana Yamaoka[1], Shiro Saito[2], and Tetsuo Kan[1]
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h - Optical, RF and Electromagnetics for MEMS/NEMS
Infrared (IR) Sensors and Imaging Systems

W375-h **INTEGRATION OF A HIGH TEMPERATURE TRANSITION METAL OXIDE NTC THIN FILM IN A MICROBOLOMETER FOR LWIR DETECTION**
Sarah Risquez[1], Sebastian Redolfi[2], Clement Fleury[1], Matthias Wulf[2], Ali Roshanghias[1], Adrien Piot[1], Jeremy Streque[1], Kerstin Schmoltner[2], Thang Duy Dao[1], Markus Puff[2], and Mohssen Moridi[1]
[1]Silicon Austria Labs GmbH, AUSTRIA and [2]TDK Electronics GmbH & Co OG, AUSTRIA

M176-h **PERIODIC CAVITIES ON THE IR-ABSORBER FOR RESPONSIVITY ENHANCEMENT OF CMOS-MEMS THERMOELECTRIC IR SENSOR**
Yung-Chen Li, Tien Chou, Pen-Sheng Lin, Yu-Cheng Huang, Fuchi Shih, You-An Lin, Da-Jen Yen, Mei-Feng Lai, and Weileun Fang
National Tsing Hua University, TAIWAN

T276-h **ULTRA-LARGE PIXEL ARRAY PHOTOTHERMAL TRANSDUCER AND ITS THERMAL PERFORMANCE PREDICTION STRATEGY**
Defang Li[1,3], Jinying Zhang[1,2], Jiushuai Xu[3], Erwin Peiner[3], Zhuo Li[1,2], Xin Wang[1], Suhui Yang[1], and Yanze Gao[1]
[1]Beijing Institute of Technology, CHINA, [2]Yangtze Delta Region Academy of Beijing Institute of Technology, CHINA, and [3]Technische Universität Braunschweig, GERMANY

h - Optical, RF and Electromagnetics for MEMS/NEMS
MEMS for Timing & Frequency Control

W376-h **A CMOS-MEMS BEAM RESONATOR WITH $Q > 10{,}000$**
Ting-Yi Chen and Wei-Chang Li
National Taiwan University, TAIWAN

M177-h **GENERIC TEMPERATURE COMPENSATION SCHEME FOR CMOS-MEMS RESONATORS BASED ON ARC-BEAM DERIVED ELECTRICAL STIFFNESS FREQUENCY PULLING**
I-Chieh Hsieh, Hong-Sen Zheng, Chun-Pu Tsai, Ting-Yi Chen, and Wei-Chang Li
National Taiwan University, TAIWAN

T277-h **HIGH-Q AND LOW-MOTIONAL IMPEDANCE PIEZOELECTRIC MEMS RESONATOR THROUGH MECHANICAL MODE COUPLING**
Linhai Huang[1], Zhihong Feng[1], Yuhao Xiao[2], Fengpei Sun[1], and Jinghui Xu[1]
[1]Huawei Technologies Company Ltd., CHINA and [2]Wuhan University, CHINA

h - Optical, RF and Electromagnetics for MEMS/NEMS
Photonic Components & Systems

W377-h **CROSSTALK-FREE LARGE APERTURE 2D GIMBAL MICROMIRROR**
Behrad Ghazinouri and Siyuan He
Toronto Metropolitan University, CANADA

M178-h **INVERSE INTERFERENCE EFFECT-ENHANCED ULTRASENSITIVE SENSING VIA MID-IR NANOANTENNAS**
Hong Zhou, Dongxiao Li, Xinge Guo, Zhihao Ren, and Chengkuo Lee
National University of Singapore, SINGAPORE

T278-h **TWISTED AND CONTACTED AU MICRO-RODS 3D CHIRAL METAMATERIALS WITH CIRCULAR DICHROISM VIA AN ABSORPTIVE ROUTE IN LONG-WAVELENGTH INFRARED**
Gaku Furusawa[1], Natsuki Kanda[2], Ryusuke Matsunaga[2], and Tetsuo Kan[1]
[1]University of Electro-Communications, JAPAN and [2]University of Tokyo, JAPAN

h - Optical, RF and Electromagnetics for MEMS/NEMS
RF MEMS Components & Systems

W378-h **3D HYBRID ACOUSTIC RESONATOR WITH COUPLED FREQUENCY RESPONSES OF SURFACE ACOUSTIC WAVE AND BULK ACOUSTIC WAVE**
Liping Zhang[1,2], Shibin Zhang[1], Jinbo Wu[1,2], Pengcheng Zheng[1,2], Hulin Yao[1,2], Yang Chen[1,2], Kai Huang[1,2], Xiaomeng Zhao[1], Min Zhou[1], and Xin Ou[1,2]
[1]Chinese Academy of Sciences, CHINA and [2]University of Chinese Academy of Sciences, CHINA

M179-h **A C/K_U DUAL-BAND RECONFIGURABLE BAW FILTER USING POLARIZATION TUNING IN LAYERED SCALN**
Dicheng Mo, Shaurya Dabas, Sushant Rassay, and Roozbeh Tabrizian
University of Florida, USA

T279-h **ACOUSTOELECTRIC-DRIVEN FREQUENCY MIXING IN MICROMACHINED LITHIUM NIOBATE ON SILICON WAVEGUIDES**
Hakhamanesh Mansoorzare and Reza Abdolvand
University of Central Florida, USA

W379-h **EFFECT OF SCANDIUM COMPOSITION ON THE PHONON SCATTERING LIFETIME OF ALUMINUM SCANDIUM NITRIDE ACOUSTIC WAVE RESONATORS**
Yue Zheng[1], Mingyo Park[1], Chao Yuan[2], and Azadeh Ansari[1]
[1]Georgia Institute of Technology, USA and [2]Wuhan University, CHINA

M180-h **LITHIUM NIOBATE THIN FILM BASED A_1 MODE RESONATORS WITH FREQUENCY UP TO 16 GHZ AND ELECTROMECHANICAL COUPLING FACTOR NEAR 35%**
Rongxuan Su[1], Zhenyi Yu[2], Sulei Fu[1], Huiping Xu[1], Shuai Zhang[1], Peisen Liu[1], Yu Guo[2], Cheng Song[1], Fei Zeng[1], and Feng Pan[1]
[1]Tsinghua University, CHINA and [2]Jiangnan University, CHINA

T280-h **SUB-3 DB INSERTION LOSS BROADBAND ACOUSTIC DELAY LINES AND HIGH FOM RESONATORS IN $LINBO_3/SIO_2$/SI FUNCTIONAL SUBSTRATE**
Chun-Chen Yeh, Chia-Hsien Tsai, Guan-Lin Wu, Tzu-Hsuan Hsu, and Ming-Huang Li
National Tsing Hua University, TAIWAN

W380-h **SUPPRESSION OF SPURIOUS MODES IN ALUMINUM NITRIDE S_1 LAMB WAVE RESONATORS USING A MECHANICAL SOFT-CONTACT SCHEME**
Shao-Siang Tung[1], Tzu-Hsuan Hsu[1], Yens Ho[2], Yung-Hsiang Chen[2], Yelehanka R. Pradeep[3], Rakesh Chand[3], and Ming-Huang Li[1]
[1]National Tsing Hua University, TAIWAN, [2]Vanguard International Semiconductor Corporation, TAIWAN, and [3]Vanguard International Semiconductor Corporation Singapore PTE. Ltd., SINGAPORE

h - Optical, RF and Electromagnetics for MEMS/NEMS
THz MEMS Components & Systems

M181-h **TERAHERTZ REFLECTIVE METALENS FOR ARBITRARY OFF-AXIS FOCUSING WITH LARGE DEPTH OF FOCUS**
Jiahao Miao, Yi Liu, Cong Lin, Zhanxuan Zhou, and Xiaomei Yu
Peking University, CHINA

h - Optical, RF and Electromagnetics for MEMS/NEMS
Other Electromagnetic MEMS/NEMS

T281-h **TOWARDS A BETTER CMOS-MEMS RESOSWITCH USING ELECTROLESS PLATING FOR CONTACT ENGINEERING**
Ting-Jui Liou, Chun-Pu Tsai, Ting-Yi Chen, and Wei-Chang Li
National Taiwan University, TAIWAN

i - Open Posters

W381-i **A MEMS-CMOS INFRA-RED MICROSYSTEM WITH IN-SENSOR MACHINE LEARNING CAPABILITIES**
Marco Castellano, Ugo Garozzo, Luca Gandolfi, Davide Ruggiero, and Giuseppe Bruno
STMicroelectronics, ITALY

M182-i **A NOVEL BAROMETRIC PRESSURE SENSOR WITH A CAPACITVE TRANSDUCER AND IMPROVED PERFORMANCE**
Thomas Friedrich[1], Volkmar Senz[1], and Ferenc Lukacs[2]
[1]Robert Bosch GmbH, GERMANY and [2]Robert Bosch Kft., HUNGARY

T282-i **A NOVEL CLASS OF MOTION SENSORS FEATURED WITH AN ELECTRIC POTENTIAL SENSING CHANNEL**
Enrico R. Alessi, Fabio Passaniti, and Emanuele Lavelli
STMicroelectronics, ITALY

W382-i **A STABLE MIR PHOTODETECTOR BASED ON 2D PTSI/P-SI NANOHOLE ARRAYS**
Ashenafi A. Elyas, Masahiko Shiraishi, and Tetsuo Kan
University of Electro-communications, JAPAN

M183-i **AN EQUIVALENT CIRCUIT MODEL FOR THE PHASE GRADIENT METASURFACE ANALYSIS IN VISIBLE BAND**
Liye Li[1], Senyong Hu[1], Yifan Ouyang[1], Yusa Chen[1], Meizhang Wu[2], and Wengang Wu[1]
[1]Peking University, CHINA and [2]University of Science and Technology Beijing, CHINA

T283-i **DETECTION OF MASS AND MATERIAL NATURE OF MICROPARTICLES BY A PIEZOELCTRIC MEMS**
Francesco Foncellino and Luigi Barretta
STMicroelectronics, ITALY

W383-i **ELECTRO-OPTICAL TESTING SOLUTION FOR TMOS MEMS SENSOR SENSITIVITY ASSESSMENT AT WAFER LEVEL**
Roberta Carbone, Dario Premi, and Marco Rossi
STMicroelectronics, ITALY

M184-i **FEMTOSECOND LASER DIRECT WRITING OF MASK FOR ACOUSTOFLUIDIC DEVICE FABRICATION**
Yong Wang[1,4], Qian Zhang[2,4], Jingui Qian[3,4], Jin Xie[2,4], and Yongqing Fu[4]
[1]Zhejiang University City College, CHINA, [2]Zhejiang University, CHINA,
[3]HeFei University of Technology, CHINA, and [4]Northumbria University, UK

T284-i HIGH PERFORMANCE SPUTTERED PZT PMUTS OPERATING IN THE ULTRASOUND IMAGING RANGE REPRODUCIBLE AT WAFER-SCALE

Jihang Liu[1], David Sze Wai Choong[1], Duan Jian Goh[1], Merugu Srinivas[1], Qing Xin Zhang[1], Steven Lee Hou Jang[1], Huamao Lin[1], Fabio Quaglia[3], Domenico Giusti[3], Laura Castoldi[3], Claudia Pedrini[3], Luca Barabani[3], Annachiara Esposito[3], Luigi Barretta[3], Rossana Scaldaferri[3], Alberto Leotti[2], Adriyan Hidayat Mohamed Hamsah[3], Peter Chang Hyun Kee[1], and Lee En-Yuan Joshua[1]
[1]Institute of Microelectronics, SINGAPORE, [2]ST Microelectronics, SINGAPORE, and [3]ST Microelectronics, ITALY

W384-i PIEZOELECTRIC ACTUATOR INTRODUCTION FOR ACCURATE POSITIONING READ/WRITE ELEMENT IN HARD DISK DRIVE (HDD)

Domenico Giusti and Marco Ferrera
STMicroelectronics, ITALY

M185-i PIEZOELECTRIC MEMS FOR MICROPARTICLES DETECTION: ALTERNATIVE READOUT FOR MASS DETECTION

Luigi Barretta and Francesco Foncellino
STMicroelectronics, ITALY

T285-i SIDE WALL DETECTION TYPE SPR SENSOR WITH GOLD GRATING ON GLASS

Masaaki Oshita, Shinichi Suzuki, Kazuto Masamoto, and Tetsuo Kan
University of Electro-Communications, JAPAN

W385-i SPUTTERED PZT AIR-COUPLED PMUTS WITH WIDE BANDWIDTH AND LONG DETECTION RANGE FOR RANGING APPLICATIONS

Mantalena Sarafianou[1], David Sze Wai Choong[1], Duan Jian Goh[1], Jihang Liu[1], Joshua En-Yuan Lee[1], Srinivas Merugu[1], Qing Xin Zhang[1], Peter Hyun Kee Chang[1], Fabio Quaglia[2], Domenico Giusti[2], Laura Castoldi[2], Filippo D'Ercoli, Riccardo Tacchini[2], Alberto Leotti[3], and Dao Hao Sim[3]
[1]Institute of Microelectronics, SINGAPORE, [2]ST Microelectronics, ITALY, and [3]ST Microelectronics, SINGAPORE

M186-i THERMOELECTRIC MIROPHONE

Akash Gupta[1], Dr. Achim Bittner[1], Prof. Dr.-Ing, and Alfons Dehe[1,2]
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T286-i ULTRA-PRECISE DEPOSITION: DIGITAL MICROMANUFACTURING FOR ADVANCED PACKAGING

Lukasz Witczak, Jolanta Gadzalinska, Iwona Gradzka-Kurzaj, Mateusz Lysien, Ludovic Schneider, Aneta Wiatrowska, Karolina Fiaczyk, Piotr Kowalczewski, Lukasz Kosior, and Filip Granek
XTPL SA, POLAND

W386-i WAFER-LEVEL DEFECT CHARACTERIZATION AND POLARITY-DEPENDENT RESISTANCE DEGRADATION OF SPUTTERED SODIUM POTASSIUM NIOBATE THIN FILMS

Kuan-Ting Ho[1], Daniel Monteiro Diniz Reis[1], and Karla Hiller[2]
[1]Robert Bosch GmbH, GERMANY and [2]Technical University Chemnitz, GERMANY