

# POWER MEMS 2017 FINAL PROGRAM

## ORAL

Wednesday, November 15

Opening Session 8:30-8:45

Invited Talk 1 8:45-9:30

**NOVEL MATERIALS AND PROCESSES TO DEVELOP VIABLE THERMOELECTRICS**

T. Mori<sup>1,2</sup>

<sup>1</sup> National Institute for Materials Science (NIMS), <sup>2</sup> University of Tsukuba, Japan

Coffee Break 9:30-10:00

**W1A Wearable Device 10:00-11:20**

**W1A.1 DEVELOPMENT OF A BATTERYLESS VHF-BEACON AND TRACKER FOR MAMMALS**

E. Bäumer, F. Schüle and P. Woias

*University of Freiburg, Germany*

This paper will also be presented in Wednesday Power MEMS in Action Demo Session PMIA.W.6.O

**W1A.2 A DYNAMIC MODEL OF ARM-EQUIPPED ROTATIONAL ENERGY HARVESTER DURING HUMAN LOCOMOTION**

Yuki Tanaka, Tomoya Miyoshi and Yuji Suzuki

*The University of Tokyo, Japan*

**W1A.3 A RAPIDLY ASSEMBLED FERROELECTRET FOR HUMAN BODY ENERGY HARVESTING**

J Shi, S. Yong and S P Beeby

*University of Southampton, UK*

**W1A.4 BATTERYLESS NEURAL INTERFACE USING TRIBOELECTRIC NANOGENERATORS (TENGS) TO ENABLE A SELF-SUSTAINABLE PLATFORM FOR NEUROMODULATION**

Sanghoon Lee<sup>1,2,3</sup>, Hao Wang<sup>1,3</sup>, Nitish V. Thakor<sup>1,2</sup>, Shih-Cheng Yen<sup>1,2</sup> and Chengkuo Lee<sup>1,2,3</sup>

<sup>1</sup> National University of Singapore, <sup>2</sup> Singapore Institute for Neurotechnology (SINAPSE), Singapore, <sup>3</sup> NUS Suzhou Research Institute (NUSRI), China

**W1B Tailored Thermoelectric Nanomaterials & Devices 1 10:00-11:20**

**W1B.1 ORGANIC-INORGANIC THERMOELECTRIC MATERIAL FOR A PRINTED GENERATOR**

K Kato<sup>1</sup>, K Kuriyama<sup>2</sup>, T Yabuki<sup>2</sup> and K Miyazaki<sup>2</sup>

<sup>1</sup> Lintec, <sup>2</sup> Kyushu Institute of Technology, Japan

**W1B.2 DEVELOPMENT AND OPTIMIZATION OF HIGH POWER DENSITY MICRO-THERMOELECTRIC GENERATORS**

Wenhua Zhang<sup>1</sup>, Juekuan Yang<sup>2</sup> and Dongyan Xu<sup>1</sup>

<sup>1</sup> The Chinese University of Hong Kong, <sup>2</sup> Southeast University, China

**W1B.3 IMPORTANCE OF GRAIN SIZE FOR NANOSTRUCTURED POLY-SI THERMOELECTRIC MATERIAL**

R. Yanagisawa<sup>1</sup>, N. Tsujii<sup>2</sup>, O. Paul<sup>3</sup>, T. Mori<sup>2</sup> and M. Nomura<sup>1,4</sup>

<sup>1</sup> University of Tokyo, <sup>2</sup> National Institute of Material Science, Japan, <sup>3</sup> IMTEK University of Freiburg, Germany, <sup>4</sup> PRESTO, Japan Science and Technology Agency, Japan

**W1B.4 TRANSPARENT THIN FILM FOR ENERGY HARVESTING**

M. Uenuma, J. C. Felizco, D. Senaha and Y. Uraoka

*Nara Institute of Science and Technology, Japan*

## Wednesday, November 15

### W2A Battery & Photovoltaic

11:30-12:30

#### W2A.1 PULSED DISCHARGE OF PRINTED SECONDARY ZN-MNO<sub>2</sub> BATTERIES FOR IOT AND WEARABLE DEVICES

B J Kim, J W Evans and P K Wright  
*University of California, Berkeley, USA*

#### W2A.2 HIGH RECYCLABILITY AND POWER PERFORMANCE OF A THIN MICRO LITHIUM-ION BATTERY ANODE

X L Kuang<sup>1,2</sup>, K D Li<sup>1,2</sup>, Y F Liu<sup>1,2</sup>, X J Feng<sup>3</sup> and X H Wang<sup>1,2</sup>  
<sup>1</sup> Tsinghua National Laboratory for Information Science and Technology, <sup>2</sup> Tsinghua University, <sup>3</sup> GCL System Integration Technology, China

#### W2A.3 PHOTOVOLTAIC MODULE ACTIVE SELF-CLEANING SURFACE USING ANISOTROPIC RATCHET CONVEYORS FABRICATED WITH PARYLENE-C STENCIL

Di Sun and Karl F. Böhringer  
*University of Washington, USA*

### W2B Tailored Thermoelectric Nanomaterials & Devices 2

11:30-12:30

#### W2B.1 AMORPHOUS THIN FILM FOR THERMOELECTRIC APPLICATION

Kenta Umeda, Jenichi Clairvaux Felizco, Daiki Senaha, Mutsunori Uenuma, Yukiharu Uraoka, Hideaki Adachi  
*Nara Institute of Science and Technology, Japan*

#### W2B.2 THERMOELECTRIC CHARACTERISTICS OF NANOCRYSTALLINE ZNO GROWN ON FABRICS FOR WEARABLE POWER GENERATOR

Hiroya Ikeda, Faizan Khan, Pandiyarasan Veluswamy, Shota Sakamoto, Mani Navaneethan, Masaru Shimomura, Kenji Murakami and Yasuhiro Hayakawa  
*Shizuoka University, Japan*

#### W2B.3 A T-SHAPED, PLATE-TYPE THERMOELECTRIC POWER GENERATOR FOR REALIZING THE HIGHER POWER DENSITY AT A SMALL TEMPERATURE DIFFERENCE

H. Tohmyoh, T. Daimon and N. Ohgi  
*Tohoku University, Japan*

### Lunch Break

12:30-14:00

### Power MEMS in Action Short Presentation

14:00-14:30

### Poster Session 1 & Power MEMS in Action Demo

14:40-16:25

**Wednesday, November 15**

**W3A Piezoelectric Materials & PiezoMEMS 1**

**16:25-17:45**

**W3A.1 HIGH FIGURE OF MERIT (MgHf)<sub>x</sub>Al<sub>1-x</sub>N THIN FILMS FOR MINIATURIZING VIBRATIONAL ENERGY HARVESTERS**

H. H. Nguyen, L. Van Minh, H. Oguchi and H. Kuwano  
*Tohoku University, Japan*

**W3A.2 MULTILAYER PIEZOELECTRIC MEMS ENERGY HARVESTER BASED ON LONGITUDINAL EFFECT**

R. Nakanishi<sup>1</sup>, K. Kanda<sup>1</sup>, T. Fujita<sup>1</sup>, I. Kanno<sup>2</sup> and K. Maenaka<sup>1</sup>  
<sup>1</sup> *University of Hyogo*, <sup>2</sup> *Kobe University, Japan*

**W3A.3 DIRECT PIEZOELECTRIC PROPERTIES OF BiFeO<sub>3</sub> EPITAXIAL FILMS GROWN BY COMBINATORIAL SPUTTERING**

T. Yoshimura, K. Kariya, N. Okamoto, M. Aramaki and N. Fujimura  
*Osaka Prefecture University, Japan*

**W3A.4 BIMORPH VIBRATION ENERGY HARVESTER WITH FLEXIBLE 3D MESH STRUCTURE**

T Tsukamoto<sup>1</sup>, Y Umino<sup>1</sup>, S Shiomi<sup>1</sup>, K Yamada<sup>1</sup> and T Suzuki<sup>1,2</sup>  
<sup>1</sup> *Gunma University*, <sup>2</sup> *JST PRESTO, Japan*

**W3B Power Management Circuit**

**16:25-17:45**

**W3B.1 EFFECTIVE PIEZOELECTRIC ENERGY HARVESTING USING BEAM PLUCKING AND A SSHI INTERFACE CIRCUIT**

Hailing Fu and Eric M. Yeatman  
*Imperial College London, UK*

**W3B.2 SELF-POWERED SSHI FOR ELECTRET ENERGY HARVESTER**

Yiran Liu and Yuji Suzuki  
*The University of Tokyo, Japan*

**W3B.3 A UNIFIED N-SECE STRATEGY FOR HIGHLY COUPLED PIEZOELECTRIC ENERGY SCAVENGERS**

A Morel<sup>1,2</sup>, A Badel<sup>2</sup>, Y Wanderoild<sup>1</sup>, A Galisultanov<sup>1</sup> and G Pillonnet<sup>1</sup>  
<sup>1</sup> *Univ. Grenoble Alpes*, <sup>2</sup> *Univ. Savoie Mont Blanc, France*

**W3B.4 CONTACTLESS FOUR-TERMINAL MEMS VARIABLE CAPACITOR FOR CAPACITIVE ADIABATIC LOGIC**

A Galisultanov<sup>1</sup>, Y Perrin<sup>1</sup>, H Samaali<sup>2</sup>, H Fanet<sup>1</sup>, P Basset<sup>2</sup> and G Pillonnet<sup>1</sup>  
<sup>1</sup> *Univ. Grenoble Alpes*, <sup>2</sup> *Université Paris-Est, France*

## Thursday, November 16

- Invited Talk 2** **8:30-9:15**
- PIEZOELECTRIC ENERGY HARVESTING SYSTEMS**  
Kenji Uchino  
*The Penn State Univ., USA*
- Power MEMS 2018 Announcement** **9:15-9:30**
- Coffee Break** **9:30-10:00**
- T1A Energy Harvesting System** **10:00-11:20**
- T1A.1 EXTENDING THE RANGE OF WIRELESS POWER TRANSMISSION FOR BIO-IMPLANTS AND WEARABLES**  
N Garraud, D Alabi, S Chyczewski, J. D. Varela, D P Arnold and A Garraud  
*University of Florida, USA*  
This paper will also be presented in Thursday Power MEMS in Action Demo Session PMIA.T.7.O
- T1A.2 A HIGHLY SENSITIVE AND ULTRA-LOW-POWER WAKE-UP RECEIVER FOR ENERGY-AUTONOMOUS EMBEDDED SYSTEMS**  
P Woias, S Heller and U Pelz  
*University of Freiburg, Germany*
- T1A.3 CONTINUOUS MACHINE HEALTH MONITORING ENABLED THROUGH SELF-POWERED EMBEDDED INTELLIGENCE AND COMMUNICATION**  
J Cornett, A O'Grady, A Vouaillat, J Michaud, F. Muret, W. Weatherholtz, J Bai, M Dunham, P Riehl, B Chen, M Farrington and T Galchev  
*Analog Devices, USA*  
This paper will also be presented in Thursday Power MEMS in Action Demo Session PMIA.T.8.O
- T1A.4 SPEED VS EFFICIENCY AND STORAGE TYPE IN PORTABLE ENERGY SYSTEMS**  
M E Kiziroglou<sup>1,2</sup>, M Cowell<sup>3</sup>, B T Kumaravel<sup>3</sup>, D E Boyle<sup>2</sup>, J W Evans<sup>3</sup>, P K Wright<sup>3</sup> and E M Yeatman<sup>2</sup>  
<sup>1</sup> ATEI Thessaloniki, Greece, <sup>2</sup> Imperial College London, UK, <sup>3</sup> University of California at Berkeley, USA
- T1B Triboelectric** **10:00-11:20**
- T1B.1 BENNET'S CHARGE DOUBLER BOOSTING TRIBOELECTRIC KINETIC ENERGY HARVESTERS**  
A Ghaffarinejad<sup>1,2</sup>, Y Lu<sup>1</sup>, R Hinchet<sup>3</sup>, D Galayko<sup>4</sup>, J Y Hasani<sup>2</sup> and P Basset<sup>1</sup>  
<sup>1</sup> Univ. Paris-Est, France, <sup>2</sup> Iran University of Science and Technology, Iran, <sup>3</sup> Sungkyunkwan Univ., Korea, <sup>4</sup> UPMC-Sorbonne Universités, France
- T1B.2 ZINC OXIDE NANOWIRE-PARYLENE NANOCOMPOSITE BASED STRETCHABLE PIEZOELECTRIC NANOGENERATORS FOR SELF-POWERED WEARABLE ELECTRONICS**  
A S Dahiya, F Morini, S Boubenia, C Justeau, K Nadaud, K P Rajeev, D Alquier and G Poulin-Vittrant  
*Université de Tours, France*
- T1B.3 A SELF-POWERED TRIBOELECTRIC SENSOR FOR WIDE-RANGE PRESSURE DETECTION IN WEARABLE APPLICATION**  
M S Rasel, H O Cho, J W Kim and J Y Park  
*Kwangwoon University, Korea*

**Thursday, November 16**

**T1B.4 SELF-POWERED TRIBOELECTRIC INERTIAL SENSOR BALL FOR IOT AND WEARABLE APPLICATIONS**  
Qiongfeng Shi, Hao Wang, Tianyiyi He and Chengkuo Lee  
*National University of Singapore, Singapore*

**T2A Thermolectric Device & System 11:30-12:30**

**T2A.1 AUTONOMOUS POWER SUPPLY FOR AERONAUTICAL HEALTH MONITORING SENSORS**  
M Bafleur<sup>1</sup>, V Boitier<sup>1</sup>, D Bramban<sup>2</sup>, J-M Dilhac<sup>1</sup>, X Dollat<sup>1</sup>, J Féau<sup>2</sup> and S Jugé<sup>3</sup>  
*<sup>1</sup> Université de Toulouse, <sup>2</sup> Airbus, <sup>3</sup> Altran Technologies, France*

**T2A.2 FABRICATION OF COPPER/COPPER-NICKEL THIN-FILM THERMOELECTRIC GENERATORS WITH ENERGY STORAGE DEVICES**  
Y Shimizu<sup>1</sup>, M Mizoshiri<sup>1</sup>, M Mikami<sup>2</sup>, J Sakurai<sup>1</sup> and S Hata<sup>1</sup>  
*<sup>1</sup> Nagoya University, <sup>2</sup> National Institute of Advanced Industrial Science and Technology, Japan*

**T2A.3 ELECTROSTATIC UNSTEADY THERMAL ENERGY HARVESTER USING NEMATIC LIQUID CRYSTAL**  
Hong Xie, Kenichi Morimoto and Yuji Suzuki  
*The University of Tokyo, Japan*

**T2B Actuator 11:30-12:30**

**T2B.1 LESS GIVES MORE: ON THE OPTIMAL FILLING FRACTION OF PIEZOELECTRIC ACOUSTIC POWER RECEIVERS**  
M Gorostiaga, M C Wapler and U Wallrabe  
*IMTEK-University of Freiburg, Germany*

**T2B.2 PULL-IN ACTUATION IN HYBRID MICRO-MACHINED CONTACTLESS SUSPENSION**  
K V Poletkin, R Shalati, J G Korvink and V Badilita  
*Karlsruhe Institute of Technology, Germany*

**T2B.3 STUDY OF DYNAMIC RESPONSE OF SILICONE ELASTOMER MICROFABRICATED HYBRID MEMBRANES VERSUS TEMPERATURES AND AGING TIME**  
A. Diallo, R. Chutani, M. Barthès, S. Bégot, S. Khadraoui, M. De Labachellerie and F. Lanzetta  
*Univ. Bourgogne Franche-Comté, France*

**Lunch Break 12:30-14:00**

**Invited Talk 3 14:00-14:45**

**AUTONOMOUS POWER SYSTEM USING SMALL SCALE VORTEX COMBUSTOR**  
D Shimokuri  
*Hiroshima University, Japan*

**Poster Session 2 & Power MEMS in Action Demo 14:55-16:40**

**Thursday, November 16**

**T3A Piezoelectric Materials & PiezoMEMS 2**

**16:40-17:40**

**T3A.1 HIGH FLEXIBLE PIEZOELECTRIC PZT THIN FILMS DEPOSITED ON STAINLESS STEEL MESH**

T Nishi, T Ito, T Umegaki and I Kanno  
*Kobe University, Japan*

**T3A.2 A HIGH PERFORMANCE PIEZOELECTRIC MICRO ENERGY HARVESTER BASED ON STAINLESS STEEL SUBSTRATES**

W.H. Tang, T.K. Lin, C.T. Chen, Y.H. Fu, S.C. Lin and W.J. Wu  
*National Taiwan University, Taiwan*

**T3A.3 FABRICATION AND CHARACTERIZATION OF MICROMACHINED PIEZOELECTRIC ENERGY HARVESTERS EXPLOITING FLEXIBLE  $\text{Pb}(\text{Nb,Zr,Ti})\text{O}_3/\text{SUS}$**

T. Takahashi<sup>1</sup>, L. Van Minh<sup>1</sup>, K. Umeda<sup>2</sup>, T. Fujii<sup>2</sup> and H. Kuwano<sup>1,3</sup>  
<sup>1</sup> *Tohoku University*, <sup>2</sup> *Fujifilm*, <sup>3</sup> *Sendai Smart Machines, Japan*

**T3B Microscale Combustion**

**16:40-17:40**

**T3B.1 H-TALIF MEASUREMENT FOR WALL RADICAL QUENCHING MODELLING IN MICROSCALE COMBUSTION**

Yong Fan<sup>1</sup>, Yu Saiki<sup>2</sup>, Sangeeth Sanal<sup>1</sup> and Yuji Suzuki<sup>1</sup>  
<sup>1</sup> *The University of Tokyo*, <sup>2</sup> *Nagoya Institute of Technology, Japan*

**T3B.2 TOWARDS A PORTABLE MESOSCALE THERMOPHOTOVOLTAIC GENERATOR**

Walker R. Chan<sup>1</sup>, Veronika Stelmakh<sup>1</sup>, Sunny Karnani<sup>2</sup>, Christopher M. Waits<sup>2</sup>, Marin Soljagic<sup>1</sup>, John D. Joannopoulos<sup>1</sup> and Ivan Celanovic<sup>1</sup>  
<sup>1</sup> *Massachusetts Institute of Technology*, <sup>2</sup> *US Army Research Laboratory, USA*

**T3B.3 DEVELOPMENT OF POWERFUL MINIATURE SYSTEM WITH HEAT TRANSFER CONTROLLED VORTEX COMBUSTOR AND THERMO ELECTRIC DEVICE**

D Shimokuri<sup>1</sup>, Y Taomoto<sup>1</sup>, H Satou<sup>2</sup> and N Yokoo<sup>2</sup>  
<sup>1</sup> *Hiroshima University*, <sup>2</sup> *Dainichi, Japan*

**Conference Banquet at ANA Crowne Plaza Hotel**

**18:30-21:00**

## Friday, November 17

### Invited Talk 4

8:30-9:15

#### **ELECTROSTATIC ENERGY HARVESTERS AND FUNDAMENTAL LIMITS TO POWER**

Einar Halvorsen

*University College of Southeast Norway, Norway*

### Coffee Break

9:15-9:30

### F1A Electrostatic / Electret

9:30-10:50

#### **F1A.1 MEMS ELECTRET ENERGY HARVESTER WITH EMBEDDED BISTABLE ELECTROSTATIC SPRING FOR BROADBAND RESPONSE**

Kazuya Murotani and Yuji Suzuki

*The University of Tokyo, Japan*

#### **F1A.2 NONLINEAR ELECTROSTATIC ENERGY HARVESTER WITH TUNABLE SENSIBILITY IN GRAVITY FIELD**

Bogdan Vysotskyi<sup>1,2</sup>, Denis Aubry<sup>2</sup>, Philippe Gaucher<sup>2</sup>, Xavier Le Roux<sup>1</sup>, Fabien Parrain<sup>1</sup> and Elie Lefeuvre<sup>1</sup>

<sup>1</sup> *Univ. Paris-Sud*, <sup>2</sup> *Université Paris-Saclay, France*

#### **F1A.3 IMPROVEMENT OF EFFECTIVENESS AND OUTPUT OF ELECTRET ENERGY HARVESTER BY SYMMETRIC COMB-DRIVE STRUCTURES**

H Honma<sup>1</sup>, H Mitsuya<sup>2</sup>, G Hashiguchi<sup>3</sup>, H Fujita<sup>1</sup> and H Toshiyoshi<sup>1</sup>

<sup>1</sup> *The University of Tokyo*, <sup>2</sup> *Saginomiya Seisakusho*, <sup>3</sup> *Shizuoka University, Japan*

#### **F1A.4 CHARACTERIZATION OF FLUORINATED NEMATIC LIQUID CRYSTAL FOR HIGH-POWER ELECTROSTATIC ENERGY HARVESTER**

K. Kittipaisalsilpa, T. Kato and Y. Suzuki

*The University of Tokyo, Japan*

### F1B Magnetic Device

9:30-10:50

#### **F1B.1 BATCH-FABRICATION AND CHARACTERIZATION OF MINIATURIZED AXISYMMETRIC ELECTROPERMANENT MAGNETS**

C Velez, L P Tatum, B S Herstein, C P Becker and D P Arnold

*University of Florida, USA*

#### **F1B.2 HIGH-TEMPERATURE COMPATIBLE, MONOLITHIC, 3D-PRINTED MAGNETIC ACTUATORS**

Anthony P Taylor<sup>1</sup> and Luis F Velásquez-García<sup>2</sup>

<sup>1</sup> *Edwards Vacuum LLC*, <sup>2</sup> *Massachusetts Institute of Technology, USA*

#### **F1B.3 NOVEL CONCEPT OF A SERIES LINEAR ELECTROMAGNETIC ARRAY ARTIFICIAL MUSCLE**

R Shalati, K V Poletkin, J G Korvink and V Badilita

*Karlsruhe Institute of Technology, Germany*

#### **F1B.4 ENERGY-AWARE 3D MICRO-MACHINED INDUCTIVE SUSPENSIONS WITH POLYMER MAGNETIC COMPOSITE CORE**

K V Poletkin<sup>1</sup>, Z. Lu<sup>2</sup>, A. Moazenzadeh<sup>3</sup>, S. G. Mariappan<sup>3</sup>, J G Korvink<sup>1</sup>, U. Wallrabe<sup>2</sup> and V Badilita<sup>1</sup>

<sup>1</sup> *Karlsruhe Institute of Technology*, <sup>2</sup> *University of Freiburg*, <sup>3</sup> *Voxalytic GmbH, Germany*

**Friday, November 17**

**F2A Piezoelectric**

**10:55-12:35**

**F2A.1 FEASIBILITY OF VIBRATION ENERGY HARVESTING POWERED WIRELESS TRACKING OF FALCONS IN FLIGHT**

Maisie M. Snowdon, James Horne, Buck Gyr and Yu Jia  
*University of Chester, UK*

**F2A.2 EXPERIMENTAL VALIDATION OF WIDEBAND PIEZOELECTRIC ENERGY HARVESTING BASED ON FREQUENCY-TUNING SYNCHRONIZED CHARGE EXTRACTION**

A. Brenes<sup>1</sup>, E. Lefeuvre<sup>1</sup> and C.-S. Yoo<sup>2</sup>  
<sup>1</sup> *Univ. Paris-Sud, France*, <sup>2</sup> *KETI, Korea*

**F2A.3 A HYBRID PIEZOELECTRIC AND ELECTROMAGNETIC ENERGY HARVESTER FOR SCAVENGING LOW FREQUENCY AMBIENT VIBRATIONS**

R M Toyabur, J W Kim and J Y Park  
*Kwangwoon University, Korea*

**F2A.4 OPTIMIZING DIMENSIONS OF UNIPOLAR TEFLON-FEP PIEZOELECTRETS WITH MICRO-SYSTEM-TECHNOLOGY**

F Emmerich and C Thielemann  
*University of Applied Sciences Aschaffenburg, Germany*

**F2A.5 ON THE DESIGN GUIDELINES FOR MINIATURIZING THERMO-MAGNETICALLY ACTIVATED PIEZOELECTRIC ENERGY GENERATOR**

Adrian Rendon-Hernandez<sup>1,2</sup> and Skandar Basrour<sup>1,2</sup>  
<sup>1</sup> *Université Grenoble Alpes*, <sup>2</sup> *CNRS, France*

**F2B Fuel Cell & Thermal Device**

**10:55-12:35**

**F2B.1 PAPER-BASED WATER MANAGEMENT SYSTEM FOR MICROFABRICATED PACKAGELESS FUEL CELL**

Simon Hamel and Luc G Fréchette  
*Université de Sherbrooke, Canada*

**F2B.2 FABRICATION AND DEMONSTRATION OF PLANAR MICRO-REACTORS FOR SOLAR STEAM METHANE REFORMING**

Jean-Francois Dufault, Ines Esmat Achouri, Nicolas Abatzoglou, Nadi Baridy, Luc G Fréchette and Mathieu Picard  
*Université de Sherbrooke, Canada*

**F2B.3 A DYNAMIC METHOD FOR THE MEASUREMENT OF PYROELECTRIC PROPERTIES OF MATERIALS**

R Ghanemotlagh, M Kroener, A N Danilewsky and P Woias  
*University of Freiburg, Germany*

**F2B.4 IMPROVED OMNIDIRECTIONAL 2D PHOTONIC CRYSTAL SELECTIVE EMITTER FOR THERMOPHOTOVOLTAICS**

Reyu Sakakibara<sup>1</sup>, Veronika Stelmakh<sup>1</sup>, Walker R. Chan<sup>1</sup>, Michael Ghebrebrhan<sup>2</sup>, John D. Joannopoulos<sup>1</sup>, Marin Soljačić<sup>1</sup> and Ivan Čelanović<sup>1</sup>  
<sup>1</sup> *Massachusetts Institute of Technology*, <sup>2</sup> *U.S. Army Natick Soldier Research, USA*

**F2B.5 UREASE ENZYME AS ANODIC CATALYST IN A MICROFLUIDIC FUEL CELL**

J. Galindo-de-la-Rosa<sup>1</sup>, R. Balam-Vera<sup>2</sup>, A. Álvarez<sup>2</sup>, E. Ortiz-Ortega<sup>1</sup>, N. Arjona<sup>1</sup>, L.G. Arriaga<sup>1</sup> and J. Ledesma-García<sup>2</sup>  
<sup>1</sup> *Centro de Investigación y Desarrollo Tecnológico en Electroquímica*, <sup>2</sup> *Universidad Autónoma de Querétaro, México*

**Closing and Award Ceremony**

**12:35-12:55**



## POSTERS

Poster Session and Power MEMS in Action Demo 1 Wednesday, November 15, 14:40-16:25

Poster Session and Power MEMS in Action Demo 2 Thursday, November 16, 14:55-16:40

Poster ID with "W" to be presented Wednesday, and "T" to be presented Thursday

### Power MEMS in Action

Power MEMS in Action Short Presentation is on Wednesday, November 15, 14:00-14:30.

#### PMIA.T.1 DEVELOPMENT OF PORTABLE POWER UNIT WITH CATALYTIC MICRO-COMBUSTOR

K Higuchi, T Nakano and S Takahashi  
*Gifu University, Japan*

#### PMIA.W.2 THREE CHANNEL HIGH DYNAMIC CURRENT MEASUREMENT SYSTEM FOR LOW POWER SYSTEMS

S Heller, I Nematollahi, S Koeble and P Woias  
*University of Freiburg, Germany*

#### PMIA.W.3 DEVELOPMENT OF PIEZOELECTRIC VIBRATION ENERGY HARVESTERS FOR BATTERY-LESS SMART SHOES

H. Katsumura<sup>1</sup>, T. Konishi<sup>1</sup>, H. Okumura<sup>1</sup>, T. Fukui<sup>1</sup>, M. Katsu<sup>2</sup>, T. Terada<sup>3</sup>, T. Umegaki<sup>3</sup> and I. Kanno<sup>3</sup>  
<sup>1</sup> Panasonic, <sup>2</sup> ASICS, <sup>3</sup> Kobe University, Japan

#### PMIA.W.4 HEATING AND COOLING THE HUMAN BODY WITH WIRELESSLY-POWERED DEVICES

Payton J Goodrich, Gabe Fierro, Vy Liu, Hui Zhang, Edward Arens  
*University of California, Berkeley, USA*

#### PMIA.T.5 DEVELOPMENT OF ROTATIONAL ELECTRET ENERGY HARVESTER USING PRINT CIRCUIT BOARD

M. Adachi<sup>1</sup>, T. Miyoshi<sup>1</sup>, K. Suzuki<sup>1</sup>, Q. Fu<sup>2</sup>, Q. Fang<sup>2</sup> and Y. Suzuki<sup>1</sup>  
<sup>1</sup> The University of Tokyo, Japan, <sup>2</sup> Huawei Technologies, China

PMIA.W.6.O Demo for an oral paper W1A.1

PMIA.T.7.O Demo for an oral paper T1A.1

PMIA.T.8.O Demo for an oral paper T1A.3

### Microfluidic / Fuel Cell / Combustion

#### PW.1 HIGH FLOW RATE OSMOTIC PUMPING UTILIZING 3D PRINTED MACROPOROUS STRUCTURES

Ling-Ying Liu and Yu-Chuan Su  
*National Tsing Hua University, Taiwan*

#### PT.2 CHARACTERIZATION OF GLUCOSE BIOFUEL CELL BASED ON ELECTRODES MODIFIED BY CARBON NANO HORNS

Kenta Kuroishi, Takuma Ishida, Toshinari Doi, Yudai Fukushi, Satomitu Imai and Yasuhiro Nishioka  
*Nihon University, Japan*

#### PW.3 ALCOHOL DEHYDROGENASE AS BIOANODE FOR METHANOL AND ETHANOL OXIDATION IN A MICROFLUIDIC FUEL CELL

J. Galindo-de-la-Rosa<sup>1</sup>, D. Vite-González<sup>2</sup>, J.A. Díaz-Real<sup>2</sup>, N. Vázquez-Maya<sup>2</sup>, A. Álvarez<sup>2</sup>, L.G. Arriaga<sup>1</sup> and J. Ledesma-García<sup>2</sup>  
<sup>1</sup> Centro de Investigación y Desarrollo Tecnológico en Electroquímica, <sup>2</sup> Universidad Autónoma de Querétaro, México

- PT.4 MICRO METHANE-OXYGEN COUNTERFLOW DIFFUSION FLAMES: EFFECTS OF GRAVITY ON FLAME STRUCTURES**  
 Satoshi Kadowaki<sup>1</sup>, Yusuke Hashimoto<sup>1</sup>, Toshiyuki Katsumi<sup>1</sup>, Thwe Thwe Aung<sup>1</sup>, Tsuneyoshi Matsuoka<sup>2</sup> and Yuji Nakamura<sup>2</sup>  
<sup>1</sup> Nagaoka University of Technology, <sup>2</sup> Toyohashi University of Technology, Japan
- PW.5 PREPARATION OF CONDUCTIVE CARBON PAPER BASED ON CARBON NANOFIBERS AND POLYPYRROLE FOR BIOFUEL CELL APPLICATION**  
 Ricardo A Escalona-Villalpando<sup>1</sup>, L G Arriaga<sup>1</sup>, Shelley D Minter<sup>2</sup> and J Ledesma-García<sup>3</sup>  
<sup>1</sup> Centro de Investigación y Desarrollo Tecnológico en Electroquímica, México, <sup>2</sup> University of Utah, USA, <sup>3</sup> Universidad Autónoma de Querétaro, México

### Photovoltaic / Battery

- PT.6 FRICTION-INDUCED FABRICATION OF FLEXIBLE SUPERCAPACITIVE MICROELECTRODES**  
 Shulan Jiang, Feng Wang, Hongbo Wang and Linmao Qian  
 Southwest Jiaotong University, China
- PW.7 SOLAR CELL EFFICIENCY IMPROVEMENT BY PHOTON ABSORPTION ENHANCEMENT EMPLOYING RARE EARTH DOPED FILMS**  
 R Lopez-Delgado<sup>1,2</sup>, J C Melendres-Sanchez<sup>1,2</sup>, A J Cordova-Rubio<sup>1,2</sup>, M E Álvarez-Ramos<sup>2</sup> and Arturo Ayon<sup>1</sup>  
<sup>1</sup> University of Texas at San Antonio, USA, <sup>2</sup> Universidad de Sonora, México
- PT.8 ENERGY NEUTRAL SENSOR SYSTEM WITH MICRO-SCALE PHOTOVOLTAIC AND THERMOELECTRIC ENERGY HARVESTING**  
 Anand Savanth<sup>1,3</sup>, Mathieu Bellanger<sup>2</sup>, Alex Weddell<sup>1</sup>, James Myers<sup>3</sup> and Mathias Kauer<sup>2</sup>  
<sup>1</sup> University of Southampton, <sup>2</sup> Lightricity, <sup>3</sup> ARM, UK

### Power Management Circuit

- PW.9 AN AUTONOMOUS POWER MANAGEMENT SYSTEM WITH EVENT-DRIVEN ENERGY HARVESTER SWITCH**  
 S. Yamada and H. Toshiyoshi  
 The University of Tokyo, Japan
- PT.10 PERFORMANCE ENHANCEMENT BY AN IMPROVED COMPACT DESIGN FOR SELF-POWERED SYNCHRONOUS SWITCHING HARVESTING CIRCUITS**  
 Weiqun Liu<sup>1</sup>, Shuang Zhang<sup>1</sup>, Adrien Badel<sup>2</sup>, Fabien Formosa<sup>2</sup> and Guangdi Hu<sup>1</sup>  
<sup>1</sup> Southwest Jiaotong University, China, <sup>2</sup> Université Savoie Mont Blanc, France
- PW.11 AUTOPARAMETRIC EXCITATION AND SELF-POWERED SSHI FOR POWER ENHANCEMENT IN PIEZOELECTRIC VIBRATION ENERGY HARVESTER**  
 H Asanuma, T Komatsuzaki and Y Iwata  
 Kanazawa University, Japan
- PT.12 NUMERICAL INVESTIGATION OF MECHANICALLY AND ELECTRICALLY SWITCHING SSHI IN HIGHLY COUPLED PIEZOELECTRIC VIBRATION ENERGY HARVESTER**  
 K Sakamoto, H Asanuma, T Komatsuzaki and Y Iwata  
 Kanazawa University, Japan
- PW.13 POWER-ELECTRONIC-INTERFACE TOPOLOGY FOR MEMS ENERGY HARVESTING WITH MULTIPLE TRANSDUCERS**  
 Binh Duc Truong<sup>1,2</sup>, Cuong Phu Le<sup>1</sup>, Einar Halvorsen<sup>1</sup> and Shad Roundy<sup>2</sup>  
<sup>1</sup> University College of Southeast Norway, Norway, <sup>2</sup> University of Utah, USA

## Magnetic Generator

- PT.14      MAGNETOSTRICTIVE LOW-COST HIGH-PERFORMANCE VIBRATION POWER GENERATOR**  
T. Ueno  
*Kanazawa University, Japan*
- PW.15      ENERGY HARVESTING DEVICES FOR CONDITION MONITORING APPLICATIONS OF PNEUMATIC COMBINED CLUTCH-BRAKES**  
D Hoffmann<sup>1</sup>, K Ylli<sup>1</sup>, A Willmann<sup>1</sup>, D Stojakov<sup>1</sup>, Y Manoli<sup>1,2</sup>, M Tijero<sup>3</sup> and M Mondragon<sup>4</sup>  
<sup>1</sup> *Hahn-Schickard*, <sup>2</sup> *University of Freiburg, Germany*, <sup>3</sup> *IK4-IKERLAN*, <sup>4</sup> *Goizper, Spain*
- PT.16      FLEXIBLE WIRELESS POWER TRANSFER SYSTEM BASED ON CLOSED-LOOP MAGNETOINDUCTIVE WAVEGUIDES: SOLUTION TO MISALIGNED AND ROTATIONAL SYSTEMS**  
Fralett Suárez Sandoval, Saraí M. Torres Delgado, Ali Moazenzadeh and Ulrike Wallrabe  
*University of Freiburg, Germany*
- PW.17      ELECTROMAGNETIC ENERGY HARVESTER WITH EMBEDDED FERROFLUID IN PCB TECHNOLOGY**  
Yi Chiu and Hao-Chiao Hong  
*National Chiao Tung University, Taiwan*
- PT.18      ENERGY HARVESTING FLEX-COIL SYSTEM FOR PNEUMATIC PISTONS**  
J Esch<sup>1</sup>, K Ylli<sup>1</sup>, D. Stojakov<sup>1</sup>, A Willmann<sup>1</sup>, D Hoffmann<sup>1</sup> and Y Manoli<sup>1,2</sup>  
<sup>1</sup> *Hahn-Schickard-Gesellschaft für angewandte Forschung e.V.*, <sup>2</sup> *University of Freiburg, Germany*
- PW.19      AN ELECTROMAGNETIC ENERGY HARVESTER CAPABLE OF FREQUENCY UP-CONVERSION AND AMPLITUDE AMPLIFICATION UNDER PULSE EXCITATION**  
D Zhu and L Evans  
*University of Exeter, UK*
- PT.20      ELECTROMAGNETIC ENERGY HARVESTER FOR ATMOSPHERIC SENSORS ON OVERHEAD POWER DISTRIBUTION LINES**  
Z Wu<sup>1</sup>, D S Nguyen<sup>1</sup>, R M White<sup>1</sup>, P K Wright<sup>1</sup>, G O'Toole<sup>2</sup> and JR Stetter<sup>2</sup>  
<sup>1</sup> *University of California, Berkeley*, <sup>2</sup> *SPEC Sensors, USA*
- PW.21      A MEMS MAGNETIC-BASED VIBRATION ENERGY HARVESTER**  
A. Shin<sup>1</sup>, U. Radhakrishna<sup>1</sup>, Yuechen Yang<sup>1</sup>, Q. Zhang<sup>2</sup>, L. Gu<sup>2</sup>, P. Riehl<sup>2</sup>, A. P. Chandrakasan<sup>1</sup> and J. H. Lang<sup>1</sup>  
<sup>1</sup> *MIT*, <sup>2</sup> *Analog Devices, USA*
- PT.22      A BROADBAND ENERGY HARVESTER USING LEAF SPRINGS AND STOPPERS WITH RESPONSE STABILIZATION CONTROL**  
S. Kato, S. Ushiki and A. Masuda  
*Kyoto Institute of Technology, Japan*
- PW.23      SOUND POWER GENERATION USING MAGNETOSTRICTIVE POWER GENERATOR**  
M. Aoki and T. Ueno  
*Kanazawa University, Japan*
- PT.24      DEVELOPMENT OF A MINIATURE WATER TURBINE POWERED BY HUMAN WEIGHT DURING WALKING**  
K Ylli<sup>1</sup>, D Hoffmann<sup>1</sup>, A Willmann<sup>1</sup> and Y Manoli<sup>1,2</sup>  
<sup>1</sup> *Hahn-Schickard*, <sup>2</sup> *University of Freiburg, Germany*
- PW.25      3D PRINTED MINIATURE WATER TURBINE WITH INTEGRATED DISCRETE ELECTRONIC ELEMENTS FOR ENERGY HARVESTING AND WATER FLOW MEASUREMENT**  
K T Adamski, J W Adamski, L Urbaniak, J A Dziuban and R D Walczak  
*Wroclaw University of Science and Technology, Poland*
- PT.26      POWER-GENERATING SHOES USING A MAGNETOSTRICTIVE VIBRATION POWER GENERATOR**  
T. Minamitani and T. Ueno  
*Kanazawa University, Japan*

- PW.27 HIGH PERFORMANCES LOW FREQUENCY VIBRATION ENERGY HARVESTER WITH HSLD STIFFNESS**  
Cyril Drezet<sup>1,2</sup>, Najib Kacem<sup>1</sup>, Nouredine Bouhaddi<sup>1</sup>, Emmanuel Foltete<sup>1</sup> and Ziad Jabbour<sup>2</sup>  
<sup>1</sup> *University of Bourgogne Franche-Comté*, <sup>2</sup> *TRAXENS, France*
- PT.28 A LOW-FREQUENCY THREE-DIMENSIONAL HYBRID ENERGY HARVESTER**  
J Zhang, T Chen, H Liu and L Sun  
*Soochow University, China*
- PW.29 DEVELOPMENT OF MEMS AIR TURBINE MICRO GENERATOR WITH BALL BEARING MECHANISM AND MAGNETIC MATERIAL**  
K. Kudo, K. Ebisawa, K. Mishima, M. Takato, K. Saito and F. Uchikoba  
*Nihon University, Japan*
- PT.30 EVALUATION OF AN IMPACT SPRING-COIL-MAGNET SYSTEM WITH 3D-PRINTED SETUP**  
P. Mehne<sup>1</sup>, P. Scholl<sup>1</sup>, A. Rudmann<sup>1</sup>, M. Kröner<sup>1</sup>, K. Van Laerhoven<sup>2</sup> and P. Woias<sup>1</sup>  
<sup>1</sup> *University of Freiburg*, <sup>2</sup> *University of Siegen, Germany*
- PW.31 SELF-POWERED WIRELESS SENSOR NODE FOR FLOW AND TEMPERATURE SENSING**  
Yushen Hu<sup>1</sup>, Jingchi Yang<sup>1</sup>, Ziyu Huang<sup>1</sup>, Yulong Zhang<sup>1,2</sup> and Fei Wang<sup>1,2,3</sup>  
<sup>1</sup> *Southern University of Science and Technology*, <sup>2</sup> *Shenzhen Key Laboratory of 3rd Generation Semiconductor Devices*, <sup>3</sup> *Chinese Academy of Sciences, China*
- PT.32 A HUMAN LOCOMOTION DRIVEN HYBRID ENERGY HARVESTER FOR WRIST WEARABLE APPLICATIONS**  
P Maharjan, J W Kim, J Y Kim and J Y Park  
*Kwangwoon University, Korea*

### **Piezoelectric Generator**

- PW.33 THE PIEZOELECTRIC PZT THIN FILMS DEPOSITED ON METAL SUBSTRATES**  
T Ito, T Nishi, T Umegaki, H Hida and I Kanno  
*Kobe University, Japan*
- PT.34 VERIFICATION OF SELF-TUNING 4DOF PIEZOELECTRIC ENERGY HARVESTER WITH ENHANCED BANDWIDTH**  
L.G.H Staaf, E. Köhler, A. D. Smith, P.D Folkow and P. Enoksson  
*Chalmers University of Technology, Sweden*
- PW.35 USING ARTIFICIAL GRAVITY LOADED NONLINEAR OSCILLATORS TO HARVEST VIBRATION WITHIN HIGH G ROTATIONAL SYSTEMS**  
James Horne, Maisie M. Snowdon and Yu Jia  
*University of Chester, UK*
- PT.36 INTERDIGITATED CANTILEVER ARRAY TOPOLOGY FOR LOW FREQUENCY MEMS VIBRATION ENERGY HARVESTING**  
Yu Jia<sup>1,2</sup>, Emmanuelle Arroyo<sup>1</sup>, Sijun Du<sup>1</sup> and Ashwin Seshia<sup>1</sup>  
<sup>1</sup> *University of Cambridge*, <sup>2</sup> *University of Chester, UK*
- PW.37 EFFECT OF NONLINEARITIES AND OBJECTIVE FUNCTION IN OPTIMIZATION OF AN ENERGY HARVESTING DEVICE**  
C D Gatti<sup>1</sup>, J M Ramirez<sup>1</sup>, M Febbo<sup>2</sup> and S P Machado<sup>1</sup>  
<sup>1</sup> *Universidad Tecnológica Nacional*, <sup>2</sup> *Universidad Nacional del Sur, Argentina*
- PT.38 OPTIMIZATION ANALYSIS OF A MAGNETIC-PIEZOELECTRIC CURRENT SENSOR**  
Po-Chen Yeh and Tien-Kan Chung  
*National Chiao Tung University, Taiwan*
- PW.39 SIMPLE METHOD FOR QUALITY FACTOR ESTIMATION IN RESONATING MEMS STRUCTURES**  
S Larsson<sup>1</sup>, P Johannisson<sup>1</sup>, D Kolev<sup>1</sup>, F Ohlsson<sup>1</sup>, S Nik<sup>2,3</sup>, J Liljeholm<sup>2,4</sup>, T Ebefors<sup>2,5</sup> and C Rusu<sup>1</sup>  
<sup>1</sup> *RISE Acreo AB*, <sup>2</sup> *SILEX Microsystems AB, Sweden*, <sup>3</sup> *IMEC, Belgium*, <sup>4</sup> *KTH-MST*, <sup>5</sup> *Spinverse AB, Sweden*

- PT.40 MULTIBEAMS ENERGY HARVESTER FOR ROTATIONAL LOW-FREQUENCIES**  
 J M Ramirez<sup>1</sup>, C D Gatti<sup>1</sup>, S P Machado<sup>1</sup> and M Febbo<sup>2</sup>  
<sup>1</sup> *Universidad Tecnológica Nacional*, <sup>2</sup> *Universidad Nacional del Sur (UNS), Argentina*
- PW.41 T-SHAPED PIEZOELECTRIC VIBRATORY MEMS HARVESTER WITH INTEGRATION OF HIGHLY EFFICIENT POWER MANAGEMENT SYSTEM**  
 Seyedfakhreddin Nabavi, Ahmed Aljaroudi and Lihong Zhang  
*Memorial University of Newfoundland, Canada*
- PT.42 DEVELOPMENT OF VIBRATION ENERGY HARVESTER WITH 2D MECHANICAL METAMATERIAL STRUCTURE**  
 Y. Umino<sup>1</sup>, T. Tsukamoto<sup>1</sup>, S. Shiomi<sup>1</sup>, K. Yamada<sup>1</sup> and T. Suzuki<sup>1,2</sup>  
<sup>1</sup> *Gunma University*, <sup>2</sup> *JST PRESTO, Japan*
- PW.43 THREE-AXIS MEMS DC MAGNETIC SENSOR USING MAGNETIC FORCE INTERACTION WITH THE PIEZOELECTRIC EFFECT**  
 Po-Chen Yeh, Hao Duan and Tien-Kan Chung  
*National Chiao Tung University, Taiwan*
- PT.44 FILM STRESS DEPENDENCE ON DEPOSITION TEMPERATURE IN SCANDIUM ALUMINIUM NITRIDE THIN FILM**  
 R Takei<sup>1</sup>, N Makimoto<sup>1</sup>, T Tabaru<sup>2</sup>, M Akiyama<sup>2</sup>, T Itoh<sup>1,3</sup> and T Kobayashi<sup>1</sup>  
<sup>1</sup> *National Institute of Advanced Industrial Science and Technology*, <sup>2</sup> *National Institute of Advanced Science and Technology*, <sup>3</sup> *The University of Tokyo, Japan*
- PW.45 IMPACT-DRIVEN UP-CONVERSION IN PIEZOELECTRIC MEMS ENERGY HARVESTERS WITH PULSED EXCITATION**  
 Pontus Johannisson, Fredrik Ohlsson and Cristina Rusu  
*RISE Acreo AB, Sweden*
- PT.46 STUDY AND MODELING OF A TRAVELING WAVE PIEZOELECTRIC TRANSFORMER**  
 T Martinez<sup>1</sup>, G Pillonnet<sup>2</sup>, D Vasic<sup>1,3</sup> and F Costa<sup>1,4</sup>  
<sup>1</sup> *Laboratoire SATIE*, <sup>2</sup> *Univ. Grenoble Alpes*, <sup>3</sup> *Université Cergy-Pontoise*, <sup>4</sup> *Université Paris-Est, France*
- PW.47 RECTIFIED OUTPUT POWER ANALYSIS OF PIEZOELECTRIC ENERGY HARVESTER ARRAYS UNDER NOISY EXCITATION**  
 Sijun Du<sup>1</sup>, Yu Jia<sup>1,2</sup>, Emmanuelle Arroyo<sup>1</sup> and Ashwin A. Seshia<sup>1</sup>  
<sup>1</sup> *University of Cambridge*, <sup>2</sup> *University of Chester, UK*
- PT.48 SHAPE EFFECTS IN DOUBLY CLAMPED BRIDGE STRUCTURES AT LARGE DEFLECTIONS**  
 Fredrik Ohlsson, Pontus Johannisson and Cristina Rusu  
*RISE Acreo AB, Sweden*
- PW.49 A PIEZOELECTRIC GENERATOR BASED ON PVDF/GO NANOFIBER MEMBRANE**  
 Kaidi Li, Xia Liu, Yifeng Liu and Xiaohong Wang  
*Tsinghua University, China*
- PT.50 PRINTED MEMS-BASED SELF-CONTAINED PIEZOELECTRIC-BASED MONITORING DEVICE FOR SMART GRIDS**  
 Hélène Debéda<sup>1</sup>, Isabel Rua-Taborda<sup>1</sup>, Egon Fernandes<sup>2</sup>, Sid Zarabi<sup>2</sup>, David Nairn<sup>2</sup>, Lan Wei<sup>2</sup> and Armaghan Salehian<sup>2</sup>  
<sup>1</sup> *Université de Bordeaux, France*, <sup>2</sup> *University of Waterloo, Canada*
- PW.51 ORIENTATION DEPENDENCE OF POWER GENERATION ON PIEZOELECTRIC ENERGY HARVESTING USING STRETCHED FERROELECTRIC POLYMER FILMS**  
 A Kobayashi<sup>1</sup>, Y Koshihara<sup>1</sup>, Y Ueno<sup>1</sup>, T Kajihara<sup>1</sup>, Y Tsujiura<sup>1</sup>, M Morimoto<sup>1,2</sup>, S Horike<sup>1</sup>, T Fukushima<sup>1</sup>, I Kanno<sup>1</sup> and K Ishida<sup>1</sup>  
<sup>1</sup> *Kobe University*, <sup>2</sup> *University of Toyama, Japan*
- PT.52 INVESTIGATION OF PIEZOELECTRIC ENERGY HARVESTING FROM HUMAN WALKING**  
 R Kakihara, K Kariya, Y Matsushita, T Yoshimura and N Fujimura  
*Osaka Prefecture University, Japan*

- PW.53 DESIGN AND OPTIMIZATION OF A FLAPPING WATER FLOW ENERGY HARVESTER**  
Jorge Antonio Nieves Juárez<sup>1,2</sup>, Ivo Neftali Ayala Garcia<sup>1</sup> and Dibin Zhu<sup>1</sup>  
<sup>1</sup> University of Exeter, UK, <sup>2</sup> Technical University of Queretaro, México

### **Electrostatic / Electret Generator**

- PT.54 METAL LAYER REINFORCED MULTILAYER FERROELECTRET-BASED ENERGY HARVESTER**  
S. Yong, J. J. Shi and S. P. Beeby  
*University of Southampton, UK*
- PW.55 OHA CERAMIC ELECTRET FOR VIBRATION ENERGY HARVESTING**  
K Hakamata<sup>1</sup>, T Miyoshi<sup>2</sup>, C Itoga<sup>1</sup>, Y Tanaka<sup>1</sup> and Y Suzuki<sup>2</sup>  
<sup>1</sup> Tokyo University of Science, <sup>2</sup> The University of Tokyo, Japan
- PT.56 ELECTRODE OPTIMIZATION OF AN ELECTRET-BASED VIBRATION GENERATOR IN SLOT-EFFECT CONFIGURATION**  
Cuong Phu Le and Einar Halvorsen  
*University College of Southeast Norway, Norway*
- PW.57 COMPARATIVE PERFORMANCE OF VOLTAGE MULTIPLIERS FOR MEMS VIBRATION-BASED ENERGY HARVESTERS**  
Binh Duc Truong, Cuong Phu Le and Einar Halvorsen  
*University College of Southeast Norway, Norway*
- PT.58 AN ELECTROSTATIC ENERGY HARVESTER WITH SANDWICHED STRUCTURE OF TWO ELECTRET LAYERS**  
Yulong Zhang<sup>1,2</sup>, Xinge Guo<sup>1</sup>, Yushen Hu<sup>1</sup> and Fei Wang<sup>1,2,3</sup>  
<sup>1</sup> Southern University of Science and Technology, <sup>2</sup> Shenzhen Key Laboratory of 3rd Generation Semiconductor Devices, <sup>3</sup> Chinese Academy of Sciences, China
- PW.59 A NON-RESONANT ROTATIONAL TRIBOELECTRIC ENERGY HARVESTER WITH HIGH OUTPUT PERFORMANCE**  
J Lin, H Liu, T Chen, Z Yang and L Sun  
*Soochow University, China*
- PT.60 CHARGE DOUBLER VIBRATION ENERGY HARVESTER USING SELF-SYNCHRONIZED MECHANICAL SWITCHES**  
M. A. Ben Ouanes<sup>1,2</sup>, H. Samaali<sup>1,2</sup>, P. Basset<sup>2</sup> and F. Najjar<sup>1</sup>  
<sup>1</sup> University of Carthage, Tunisia, <sup>2</sup> Université Paris-Est, France
- PW.61 NON-LINEAR VIBRATION ELECTRET-HARVESTER WITH OPTIMIZED CURVED BEAM FOR LOW-FREQUENCY OPERATION**  
Koki Yamamoto<sup>1</sup>, Adrien Badel<sup>1</sup>, Fabien Formosa<sup>1</sup>, Ludovic Charleux<sup>1</sup>, Takayuki Fujita<sup>2</sup>, Kensuke Kanda<sup>2</sup> and Kazusuke Maenaka<sup>2</sup>  
<sup>1</sup> Université Savoie Mont Blanc, France, <sup>2</sup> University of Hyogo, Japan

### **Thermoelectric Generator**

- PT.62 PROBING THERMAL PHONON MEAN FREE PATH USING PHONONIC CRYSTAL NANOSTRUCTURES**  
M Nomura<sup>1,2</sup>, J Nakagawa<sup>1</sup>, K Sawano<sup>3</sup>, J Maire<sup>1</sup> and S Volz<sup>1</sup>  
<sup>1</sup> The University of Tokyo, <sup>2</sup> PRESTO, Japan Science and Technology Agency, <sup>3</sup> Tokyo City University, Japan
- PW.63 THERMOELECTRIC PROPERTIES OF SIZE-CONTROLLED SI AND METAL SILICIDES NANOCOMPOSITES**  
S. Tanusilp<sup>1</sup>, A. Yusufu<sup>1,2</sup> and K. Kurosaki<sup>1,3</sup>  
<sup>1</sup> Osaka University, <sup>2</sup> University of Fukui, <sup>3</sup> JST PRESTO, Japan

- PT.64 FIELD-EFFECT AND CHEMICAL CHARGE-TYPE MODULATIONS OF CARBON NANOTUBES USING FUNCTIONAL POLYMERS FOR THERMOELECTRIC ENERGY HARVESTERS**  
S Horike<sup>1</sup>, T Fukushima<sup>1</sup>, T Saito<sup>2</sup>, Y Koshiba<sup>1</sup>, M Morimoto<sup>3</sup> and K Ishida<sup>1</sup>  
<sup>1</sup> Kobe University, <sup>2</sup> National Institute of Advanced Science and Technology, <sup>3</sup> University of Toyama, Japan
- PW.65 THERMOELECTRIC PERFORMANCES CONTROLLED BY NANOSCALE INTERFACES IN TRANSPARENT EMBEDDED-ZnO NANOWIRES STRUCTURE**  
Takafumi Ishibe, Atsuki Tomeda, Kentaro Watanabe, Yoshiaki Nakamura  
Osaka university, Japan
- PT.66 A FULLY INTEGRATED AUTONOMOUS POWER MANAGEMENT SYSTEM WITH HIGH POWER CAPACITY AND NOVEL MPPT FOR THERMOELECTRIC ENERGY HARVESTERS IN IOT/WEARABLE APPLICATIONS**  
Hamed Osouli Tabrizi<sup>1</sup>, H M P C Jayaweera<sup>1</sup> and Ali Muhtaroglu<sup>1,2</sup>  
<sup>1</sup> Sustainable Environment and Energy Systems, <sup>2</sup> Middle East Technical University, Turkey
- PW.67 THERMOELECTRIC PROPERTIES OF CHROMIUM SELENIDES**  
Quansheng Guo, Takao Mori  
National Institute for Materials Science, Japan
- PT.68 FABRICATION AND CHARACTERIZATION OF ROLL-TYPE THIN-FILM THERMOELECTRIC GENERATORS**  
J. Hamada, K. Yamamoto and M. Takashiri  
Tokai University, Japan
- PW.69 IN-PLANE THERMOELECTRIC PROPERTIES OF NANO-TiS<sub>2</sub>/CNT/PEDOT-PSS HYBRID FILMS**  
K Okamoto and H Anno  
Tokyo University of Science, Yamaguchi, Japan
- PT.70 DESIGN AND PERFORMANCE OF Π-TYPE THIN-FILM NANO THERMOELECTRIC GENERATORS**  
T Seino, N Chiwaki, S Yamashita and S Sugahara  
Tokyo Institute of Technology, Japan
- PW.71 ENHANCEMENT OF THERMOELECTRIC POWER OF SILICON NANOWIRE MICRO THERMOELECTRIC GENERATOR BY IMPROVING THE THERMAL CONDUCTIVITY OF AIR THERMAL CONDUCTIVE FILM**  
Tianzhuo Zhan  
Waseda University, Japan
- PT.72 SUPRAMOLECULAR CARBON NANOTUBE FILMS ADAPTIVE TO THERMOELECTRICS**  
Yoshiyuki Nonoguchi<sup>1,2</sup> and Tsuyoshi Kawai<sup>1</sup>  
<sup>1</sup> Nara Institute of Science and Technology, <sup>2</sup> JST PRESTO, Japan
- PW.73 DESIGN AND PERFORMANCE OF TRANSVERSE-TYPE THIN-FILM NANO-THERMOELECTRIC GENERATORS**  
N Chiwaki, T Seino and S Sugahara  
Tokyo Institute of Technology, Japan
- PT.74 FLEXIBLE THERMOELECTRIC SYSTEM BASED ON INORGANIC BULK MATERIALS**  
H.J Park, D.G Kim, Y.M Eom, W. Dimuthu, D.K Lee and W. Kim  
Yonsei University, Korea
- PW.75 ENHANCEMENT OF THERMOELECTRIC PROPERTIES BY EPITAXIAL NANODOTS IN Si FILMS**  
Shunya Saknae<sup>1</sup>, Kentaro Watanabe<sup>1</sup>, Takeshi Fujita<sup>3</sup>, Md. Mahfuz Alam<sup>4</sup>, Kentarou Sawano<sup>4</sup>, Yoshiaki Nakamura<sup>1</sup>  
<sup>1</sup> Osaka University, <sup>2</sup> CREST-JST, <sup>3</sup> Tohoku University, <sup>4</sup> Tokyo City University, Japan
- PT.76 DEVELOPMENT OF STACKING TYPE THERMOELECTRIC POWER GENERATION UNIT FOR POTENTIAL WASTE HEAT RECOVERY APPLICATIONS.**  
Hirotaka Nishiate, Atsushi Yamamoto  
AIST, Japan

## Late News

- LN.W.1 A 3-WAY PUSHABLE ELECTRET-BASED ENERGY HARVESTER FABRICATED WITH 3D-PRINTING AND PDMS MOLDING**  
Y. F. Chen<sup>1</sup>, H. Honma<sup>2</sup> and H. Toshiyoshi<sup>2</sup>  
*<sup>1</sup> National Taiwan University, Taiwan, <sup>2</sup> The University of Tokyo, Japan*
- LN.T.2 THERMOELECTRIC NANOGENERATOR NETWORKS: A VIABLE SOURCE OF POWER FOR AUTONOMOUS WIRELESS SENSORS**  
D. Tainoff, A. Proudnom, C. Tur, T. Crozes, S. Dufresnes, S. Dumont, D. Bourgault and O. Bourgeois  
*Université Grenoble Alpes, France*
- LN.W.3 DEVELOPMENT OF ELECTRICAL GENERATOR USING FERROMAGNETIC POWDERS AND NON-MAGNETIC FLUID**  
Haruhiko Shirai<sup>1</sup>, Hiromichi Mitamura<sup>1</sup>, Takuji Noda<sup>2</sup>, Nobuaki Arai<sup>1</sup> and Kazuyuki Moriya<sup>1</sup>  
*<sup>1</sup> Kyoto University, <sup>2</sup> The Institute of Statistical Mathematics, Japan*
- LN.T.4 VIBRATION ENERGY HARVESTING WITH PIEZOELECTRETS AND ELECTRETS**  
X. Zhang<sup>1</sup> and G. M. Sessler<sup>2</sup>  
*<sup>1</sup> Tongji University, China, <sup>2</sup> Darmstadt University of Technology, Germany*
- LN.W.5 THE DEVELOPMENT OF THE CANTILEVER TYPED VIBRATION POWER GENERATION FLOOR**  
T. Yoshikawa  
*Kindai University Technical College, Japan*
- LN.T.6 SWEAT AS ENERGY SOURCE USING AN ENZYMIC MICROFLUIDIC FUEL CELL**  
E. Ortiz-Ortega<sup>1</sup>, R. A. Escalona-Villalpando<sup>1</sup>, J. Galindo-de-la-Rosa<sup>1</sup>, J. Ledesma-García<sup>2</sup>, S. D. Minter<sup>3</sup> and L.G. Arriaga<sup>1</sup>  
*<sup>1</sup> Centro de Investigación y Desarrollo Tecnológico en Electroquímica, <sup>2</sup> Universidad Autónoma de Querétaro, México, <sup>3</sup> University of Utah, USA*
- LN.W.7 TOWARD CMOS COMPATIBLE WAFER-SCALE FABRICATION OF CARBON-BASED MICROSUPERCAPACITORS FOR IOT**  
A D Smith<sup>1</sup>, Q Li<sup>1</sup>, A Anderson<sup>2</sup>, A Vyas<sup>1</sup>, V Kuzmenko<sup>1</sup>, M Haque<sup>1</sup>, L G H Staaf<sup>1</sup>, P Lundgren<sup>1</sup> and P Enoksson<sup>1</sup>  
*<sup>1</sup> Chalmers University of Technology, Sweden, <sup>2</sup> University of Santa Barbara, USA*
- LN.T.8 MASK-PROGRAMMABLE ON-CHIP PHOTOVOLTAIC CELL ARRAY**  
Y. Takeshiro, Y. Okamoto and Y. Mita  
*The Univ. of Tokyo, Japan*
- LN.W.9 POWER ELECTRONICS FOR WIRELESS POWER DELIVERY IN SYNTHETIC SENSOR NETWORKS**  
P. D. Mitcheson, G. Kkelis, S. Aldhafer, J.M. Arteaga, D. C. Yates, D. Boyle and E. M. Yeatman  
*Imperial College London, UK*