



Preliminary Technical Program

The Executive Committee reserves the right to amend the program, if necessary.

Wednesday, December 5

08:00 **Conference Welcome**

David P. Arnold, *University of Florida, USA*
Luc Fréchette, *Université de Sherbrooke, CANADA*

08:20 **Plenary Presentation I**

WPL1A **OPTIMIZING ENERGY BALANCE TO ACHIEVE AUTONOMOUS SELF-POWERING FOR VIGILANT HEALTH AND IOT APPLICATIONS**

Veena Misra, A. Bozkurt, B. Calhoun, S. Datta, J. Jur, J. Lach, O. Oralkan, M. Ozturk, S. Troler-McKinstry, S. Roundy, R. Rajagopalan, D. Vashae, and D. Wentzloff
North Carolina State University, USA

09:00 **Focus Session I - Wearable Energy Harvesters**

09:00 - 09:20

WF1A-01 **FLEXIBLE TEXTILE POWER MODULE**

S. Yong, J. Shi, and S. Beeby
University of Southampton, UK

09:20 - 09:40

WF1A-02 **FABRICATION AND CHARACTERIZATION OF A WRIST DRIVEN ROTATIONAL ENERGY HARVESTER USING MULTIPLE PLUCKED PIEZOELECTRIC UNIMORPHS**

M.A. Halim¹, T. Xue¹, R. Rantz¹, Q. Zhang², L. Gu², K. Yang², and S. Roundy¹
¹*University of Utah, USA* and ²*Analog Devices Inc., USA*

09:40 - 10:00

WF1A-03 **A FULLY-ENCLOSED WRIST-WEARABLE HYBRID NANOGENERATOR FOR SELF-POWERED SENSORS**

P. Maharjan and, J.Y. Park
Kwangwoon University, KOREA

10:00 **Refreshment Break**

SESSION W1A: FUEL CELLS AND REACTORS	SESSION W1B: TUNABLE, BROADBAND, AND NONLINEAR HARVESTERS
Crystal – Tomoka Room	Flagler Room
10:30 – 10:50	
<p style="text-align: center;">W1A-02</p> <p>TESTING OF A 3D-PRINTED SOLAR MICRO-REACTOR FOR HYDROGEN PRODUCTION VIA NATURAL GAS REFORMING</p> <p>P. Camus, J.-F. Dufault, D. Mehanovic, N. Braidy, L.G. Fréchet, and M. Picard <i>Université de Sherbrooke, CANADA</i></p>	<p style="text-align: center;">W1B-01</p> <p>MODELING AND DESIGN OF HIGHLY COUPLED PIEZOELECTRIC ENERGY HARVESTERS FOR BROADBAND APPLICATIONS</p> <p>D. Gibus¹, P. Gasnier¹, A. Morel^{1,2}, S. Boisseau¹, and A. Badel² <i>¹University Grenoble Alpes, CEA-Leti, FRANCE and ²Université Savoie Mont Blanc, FRANCE</i></p>
10:50 – 11:10	
<p style="text-align: center;">W1A-02</p> <p>MICRO ALKALINE FUEL CELL SUPPORTED BY MEMS-BASED BACKBONE</p> <p>M. Pilaski¹, S.-H. Sun², G. Dura³, J. Wartmann³, F. Letzkus², and A. Heinzel³ <i>¹ZBT GmbH, GERMANY, ²Institut für Mikroelektronik Stuttgart, GERMANY, and ³Hydrogen and Fuel Cell Center, GERMANY</i></p>	<p style="text-align: center;">W1B-02</p> <p>CO-OPTIMIZATION OF A PIEZOELECTRIC ENERGY HARVESTING SYSTEM FOR BROADBAND OPERATION</p> <p>S. Zhao¹, U. Radhakrishna², S. Hanly³, J. Ma⁴, J.H. Lang², and D. Buss⁵ <i>¹Tianjin University, CHINA, ²Massachusetts Institute of Technology, USA, ³Mide Technology, USA, ⁴Guangdong University of Technology, CHINA, and ⁵Texas Instruments, USA</i></p>
11:10 – 11:30	
<p style="text-align: center;">W1A-03</p> <p>THERMALLY SELF-SUSTAINING TUBULAR SOFC POWER GENERATOR WITH NO MOVING PARTS</p> <p>J. Wongwiwat¹, P. Bhuripanyo¹, T.S. Welles², V.P. DeBiase², J. Ahn², and P.D. Ronney¹ <i>¹University of Southern California, USA and ²Syracuse University, USA</i></p>	<p style="text-align: center;">W1B-03</p> <p>TOWARD SELF-POWERED NONLINEAR WIDEBAND VIBRATION ENERGY HARVESTING WITH HIGH-ENERGY RESPONSE STABILIZATION</p> <p>S. Ushiki and A. Masuda <i>Kyoto Institute of Technology, JAPAN</i></p>
11:30 – 11:50	
<p style="text-align: center;">W1A-04</p> <p>MINIATURE FUEL CELL WITH MONOLITHICALLY FABRICATED SI ELECTRODE -FIRST PROTOTYPE WITH AU-PD-PT MULTILAYER CATALYST-</p> <p>T. Kurose¹, R. Shirai¹, N. Vasiljevic², and M. Hayase¹ <i>¹Tokyo University of Science, JAPAN and ²University of Bristol, UK</i></p>	<p style="text-align: center;">W1B-04</p> <p>SELF-TUNABLE VIBRATION ENERGY HARVESTER</p> <p>J. Esch¹, D. Hoffmann¹, D. Stojakov¹, and Y. Manoli² <i>¹Hahn-Schickard, GERMANY and ²University of Freiburg, GERMANY</i></p>

SESSION W2A: THERMOELECTRIC ENERGY HARVESTERS		SESSION W2B: POWER ELECTRONICS AND ENERGY MANAGEMENT CIRCUITS	
Crystal – Tomoka Room		Flagler Room	
13:30 – 13:50			
<p style="text-align: center;">W2A-01</p> <p>POWER ENHANCEMENT OF SILICON MEMBRANE-BASED THERMOELECTRIC ENERGY HARVESTER WITH TAILORED HOLEY NANOSTRUCTURES</p> <p>R. Yanagisawa and M. Nomura <i>University of Tokyo, JAPAN</i></p>		<p style="text-align: center;">W2B-01</p> <p>A SELF-SUSTAINED ENERGY STORAGE SYSTEM WITH AN ELECTROSTATIC AUTOMATIC SWITCH AND A BUCK DC-DC CONVERTER FOR TRIBOELECTRIC NANOGENERATORS</p> <p>H. Zhang¹, D. Galayko², and P. Basset¹ ¹<i>Université Paris-Est, FRANCE</i> and ²<i>Sorbone Universités, FRANCE</i></p>	
13:50 – 14:10			
<p style="text-align: center;">W2A-02</p> <p>VERTICAL SELF-DEFINED THERMOELECTRIC LEGS FOR USE IN THIN FILM TEGS</p> <p>Y. Yuan and K. Najafi <i>University of Michigan, USA</i></p>		<p style="text-align: center;">W2B-02</p> <p>DUAL-STAGE ELECTRODE DESIGN OF ROTATIONAL ELECTRET ENERGY HARVESTER FOR EFFICIENT SELF-POWERED SSHI</p> <p>Y. Liu¹, A. Badel², and Y. Suzuki¹ ¹<i>University of Tokyo, JAPAN</i> and ²<i>Université Savoie Mont Blanc, FRANCE</i></p>	
14:10 – 14:30			
<p style="text-align: center;">W2A-03</p> <p>DESIGN AND IMPLEMENTATION OF A SOIL PROFILE PROBE POWERED BY AIR AND SOIL TEMPERATURE DIFFERENCES</p> <p>N. Ikeda, R. Shigeta, J. Shiomi, and Y. Kawahara <i>University of Tokyo, JAPAN</i></p>		<p style="text-align: center;">W2B-03</p> <p>A SIMPLE PASSIVE 400 mV AC/DC RECTIFIER FOR ENERGY HARVESTING APPLICATIONS</p> <p>A. Santiago Rodriguez, N. Garraud, D. Alabi, A. Garraud, and D.P. Arnold <i>University of Florida, USA</i></p>	

SESSION W3A: ION SOURCES AND THERMOIONIC EMITTERS	SESSION W3B: MICROFABRICATED HARVESTERS
Crystal – Tomoka Room	Flagler Room
14:40 – 15:00	
<p style="text-align: center;">W3A-01</p> <p>COMPACT, 3D-PRINTED ELECTRON IMPACT ION SOURCE WITH MICROFABRICATED, NANOSHARP SI FIELD EMITTER ARRAY CATHODE Yang and L.F. Velásquez-Garcia <i>Massachusetts Institute of Technology, USA</i></p>	<p style="text-align: center;">W3B-01</p> <p>PUSH-BUTTON KINETIC ENERGY HARVESTER WITH SOFT-X-RAY-CHARGED FOLDED MULTILAYER PIEZOELECTRET J. Lu and Y. Suzuki <i>University of Tokyo, JAPAN</i></p>
15:00 – 15:20	
<p style="text-align: center;">W3A-02</p> <p>GLOW-DISCHARGE ION SOURCE FOR ON-CHIP INTEGRATED MINIATURE MEMS MASS SPECTROMETER T. Grzebyk, P. Szyszka, A. Górecka-Drzazga, and J.A. Dziuban <i>Wroclaw University of Science and Technology, POLAND</i></p>	<p style="text-align: center;">W3B-02</p> <p>A SILICON MEMS EM VIBRATION ENERGY HARVESTER Y. Yang, U. Radhakrishna, D. Ward, A. Chandrakasan, and J. Lang <i>Massachusetts Institute of Technology, USA</i></p>
15:20 – 15:40	
<p style="text-align: center;">W3A-03</p> <p>THERMIONIC ENERGY CONVERTER BASED ON MICRON-GAP NANOSTRUCTURED SPACERS: ACHIEVING RECORD-HIGH SHORT-CIRCUIT CURRENT S.M. Nicaise¹, C. Lin¹, M. Azadi¹, T. Bozorg-Grayeli², P. Adebayo-Ige¹, K. Van Houten³, F. Schmitt³, D.E. Lilley¹, Y. Pfitzer¹, W. Cha¹, N. Melosh², R.T. Howe², J.W. Schwede¹, and I. Bargatin¹ ¹<i>University of Pennsylvania, USA,</i> ²<i>Stanford University, USA, and</i> ³<i>Spark Thermionics, USA</i></p>	<p style="text-align: center;">W3B-03</p> <p>A POWER-DENSITY-ENHANCED MEMS ELECTROSTATIC ENERGY HARVESTER WITH SYMMETRIZED HIGH-ASPECT RATIO COMB ELECTRODES H. Honma¹, H. Mitsuya², G. Hashiguchi³, H. Fujita⁴, and H. Toshiyoshi¹ ¹<i>University of Tokyo, JAPAN,</i> ²<i>Saginomiya Seisakusho, Inc., JAPAN,</i> ³<i>Shizuoka University, JAPAN, and</i> ⁴<i>Tokyo City University, JAPAN</i></p>

15:40

Transition Break

15:50

Poster and PowerMEMS - in - Action Session A

17:50

End of Day

Thursday, December 6

08:00 **Conference Announcements**

08:15 **Exhibitor Table-Top Elevator Pitches**

08:20 **Plenary Presentation II**

TPL1A **MULTIFERROIC MATERIALS, DEVICES AND SYSTEMS:
P(VDF-TrFE) BASED SPIRAL THERMO-MAGNETO-ELECTRIC
GENERATORS FOR HARVESTING LOW GRADE THERMAL ENERGY**
R.A. Kishore¹, D. Singh¹, P. Kumar¹, R. Sriramdas¹, M. Sanghadasa², and
Shashank Priva³
¹Virginia Polytechnic Institute and State University, USA,
²Aviation & Missile Research Development and Engineering Center and
³Pennsylvania State University, USA

09:00 **Focus Session II - Multiferroic Devices and Systems**

09:00 - 09:20

TF1A-01 **ELECTRIC-FIELD CONTROLLED MAGNETIC REORIENTATION IN
EXCHANGED COUPLED COFEB/NI BILAYER MICROSTRUCTURES**
Z. Xiao¹, R. Lo Conte², M. Goiriena², R.V. Chopdekar², X. Li¹, S. Tiwari¹,
G.P. Carman¹, K. Wang¹, J. Bokor², and R.N. Candler¹
¹University of California, Los Angeles, USA and
²University of California, Berkeley, USA

09:20 - 09:40

TF1A-02 **BAR-SHAPED MAGNETOELECTRIC GYRATOR**
C.M. Leung, J.F. Li, and D. Viehland
Virginia Polytechnic Institute and State University, USA

09:40 - 10:00

TF1A-03 **WIDE-BAND MULTIFERROIC QUARTZ MEMS ANTENNAE**
R.L. Kubena¹, W.S. Wall¹, K.G. Lee¹, X. Pang², and Y.K. Yong²
¹HRL Laboratories, LLC., USA and ²Rutgers University, USA

10:00 **Refreshment Break**

SESSION T4A: BIOCHEMICAL AND BIO- INSPIRED POWER/ENERGY SYSTEMS	SESSION T4B: ELECTRET MATERIALS AND HARVESTERS
Crystal – Tomoka Room	Flagler Room
10:30 – 10:50	
<p style="text-align: center;">T4A-01</p> <p>SUPERCAPACITIVE MICRO-BIO- PHOTOVOLTAICS</p> <p>L. Liu, M. Mohammadifar, and S. Choi <i>State University of New York, Binghamton, USA</i></p>	<p style="text-align: center;">T4B-01</p> <p>DEVELOPMENT OF A HIGH- PERFORMANCE AMORPHOUS FLUORINATED POLYMER ELECTRET BASED ON QUANTUM CHEMICAL ANALYSIS</p> <p>S. Kim, K. Suzuki, and Y. Suzuki <i>University of Tokyo, JAPAN</i></p>
10:50 – 11:10	
<p style="text-align: center;">T4A-02</p> <p>TATTOO-BASED ON BIOFUEL CELL WIRELESS USING LACTATE FROM SWEAT AS FUEL</p> <p>R.A. Escalona-Villalpando¹, E. Ortiz-Ortega¹, J.P. Bocanegra-Ugalde², S.D. Minter³, L.G. Arriaga¹, and J. Ledesma-García² <i>¹Centro de Investigación y Desarrollo Tecnológico en Electroquímica, MEXICO, ²University Autonomous Queretaro, MEXICO, and ³University of Utah, USA</i></p>	<p style="text-align: center;">T4B-02</p> <p>DEMONSTRATION OF AN ELECTRET GENERATOR FOR ENERGY HARVESTING WITHOUT ANY CHARGING PROCESS: UTILIZATION OF SPONTANEOUS ORIENTATION OF POLAR MOLECULES</p> <p>Y. Tanaka, N. Matsuura, and H. Ishii <i>Chiba University, JAPAN</i></p>
11:10 – 11:30	
<p style="text-align: center;">T4A-03</p> <p>VIRUS ASSEMBLED TECHNOLOGY FOR NEXT GENERATION BIOENERGY HARVESTING DEVICES</p> <p>S. Chu, A.D. Brown, J.N. Culver, and R. Ghodssi <i>University of Maryland, USA</i></p>	<p style="text-align: center;">T4B-03</p> <p>STOCHASTIC MODELING OF HUMAN ARM SWING TOWARD STANDARD TESTING FOR ROTATIONAL ENERGY HARVESTER</p> <p>Y. Tanaka, T. Miyoshi, and Y. Suzuki <i>University of Tokyo, JAPAN</i></p>
11:30 – 11:50	
<p style="text-align: center;">T4A-04</p> <p>A NOVEL FLEXIBLE CONDUCTIVE SPONGE-LIKE ELECTRODE CAPABLE OF GENERATING ELECTRICAL ENERGY FROM THE DIRECT OXIDATION OF AQUEOUS GLUCOSE</p> <p>D. Desmaële¹, F. La Malfa^{1,2}, F. Rizzi¹, A. Quattieri¹, M. Di Lorenzo³, and M. De Vittorio^{1,2} <i>¹IIT-CBN, ITALY, ²Universita del Salento, ITALY, and ³University of Bath, UK</i></p>	<p style="text-align: center;">T4B-04</p> <p>SELF-RECHARGEABLE ELECTRET BASED ON VIBRATION ENERGY HARVESTER</p> <p>Y. Zhang, Y. Hu, M. Wang, and F. Wang <i>Southern University of Science and Technology, CHINA</i></p>

11:50

Lunch on Own

SESSION T5A: BATTERY TECHNOLOGIES	SESSION T5B: PYROELECTRIC ENERGY HARVESTERS
Crystal – Tomoka Room	Flagler Room
13:30 – 13:50	
<p style="text-align: center;">T5A-01</p> <p>A LONG-LASTING MICROLITER-SCALE MICROBIAL BIOBATTERY USING SOLID-STATE IONICS M. Mohammadifar and S. Choi <i>State University of New York, Binghamton, USA</i></p>	<p style="text-align: center;">T5B-01</p> <p>HYBRIDIZED THERMAL ENERGY HARVESTING MECHANISM M. Kang and E.M. Yeatman <i>Imperial College London, UK</i></p>
13:50 – 14:10	
<p style="text-align: center;">T5A-02</p> <p>DESIGN, MICROFABRICATION AND CHARACTERIZATION OF FREE FORM FACTOR, LIGHTWEIGHT THIN FILM BATTERY FOR POWERING BIOINSPIRED NANODRONES BASED ON MEMS ACTUATION S. Oukassi¹, S. Poncet¹, J.R. Frutos², and R. Salot¹ ¹<i>CEA LETI, FRANCE and</i> ²<i>Silmach SA, FRANCE</i></p>	<p style="text-align: center;">T5B-02</p> <p>PYROELECTRIC THIN FILM OF ORIENTED TRIGLYCINE SULFATE NANO-CRYSTALS FOR THERMAL ENERGY CONVERSION R.G. Ghane <i>University of Freiburg, GERMANY</i></p>
14:10 – 14:30	
<p style="text-align: center;">T5A-03</p> <p>DEVELOPMENT OF ALL-SOLID-STATE THIN-FILM SECONDARY BATTERY FOR MEMS AND IOT DEVICE A. Suzuki, S. Sasaki, and T. Jimbo <i>ULVAC, Inc., JAPAN</i></p>	<p style="text-align: center;">T5B-03</p> <p>PIEZOELECTRIC AND PYROELECTRIC ENERGY HARVESTING FROM LITHIUM NIOBATE FILMS G. Clementi, S. Margueron, M.A. Suarez, T. Baron, B. Dulmet, and A. Bartasyte <i>FEMTO-ST, FRANCE</i></p>

14:30

Transition Break

SESSION T6A: WIRELESS POWER TRANSFER TECHNOLOGIES		SESSION T6B: PUMPS AND HEAT ENGINES	
Crystal – Tomoka Room		Flagler Room	
14:40 – 15:00			
T6A-01	T6B-01		
FLEXIBLE SCREEN-PRINTED COILS FOR WIRELESS POWER TRANSFER USING LOW-FREQUENCY MAGNETIC FIELDS K. Sondhi, N. Garraud, D. Alabi, D.P. Arnold, A. Garraud, Z.H. Fan, and T. Nishida <i>University of Florida, USA</i>	LOW-COST, MONOLITHICALLY 3DPRINTED, MINIATURE HIGH-FLOW RATE LIQUID PUMP A.P. Taylor ¹ and L.F. Velásquez–García ² ¹ <i>Edwards Vacuum, USA and</i> ² <i>Massachusetts Institute of Technology, USA</i>		
15:00 – 15:20			
T6A-02	T6B-02		
EXPERIMENTAL STUDY OF THE EFFECT OF DEPTH, ORIENTATION, AND ALIGNMENT FOR A MEMS DIAPHRAGM RECEIVER IN ACOUSTIC POWER TRANSFER SYSTEMS H. Basaeri, Y. Yu, D. Young, and S. Roundy <i>University of Utah, USA</i>	MISTIC - MICRO STIRLING HEAT ENGINES FOR THERMAL ENERGY HARVESTING T. Avetissian ¹ Léveillé ¹ , M.A. Hachey ¹ , F. Formosa ² , and L.G. Fréchette ¹ ¹ <i>Université de Sherbrooke, CANADA and</i> ² <i>Université Savoie Mont Blanc, FRANCE</i>		

15:20

Transition Break

15:30

Poster & PowerMEMS - in - Action Session B

17:30

End of Day

17:30

Banquet at Kennedy Space Center

22:00

Arrive back at the Hilton Daytona Beach

Friday, December 7

08:00 **Conference Announcements**

08:10 **PowerMEMS 2019 Announcement**

08:20 **Plenary Presentation III**

FPL1A **ZERO AND NEAR ZERO POWER INTELLIGENT MICROSYSTEMS**

Roy (Troy) Olsson

Defense Advanced Research Projects Agency (DARPA), USA

09:00 **Focus Session III – Zero-Power Devices and Systems**

09:00 - 09:20

FF1A-01 **AN AUTONOMOUS INTERFACE CIRCUIT BASED ON SELF-INVESTING SYNCHRONOUS ENERGY EXTRACTION FOR LOW POWER PIEZOELECTRIC ENERGY HARVESTERS**

B. Çiftci, S. Chamanian, H. Ulsan, and H. Külah

Middle East Technical University, TURKEY

09:20 - 09:40

FF1A-02 **ENERGY HARVESTING PIEZOELECTRIC WIND SPEED SENSOR**

M. Shi, E.M. Yeatman, and A.S. Holmes

Imperial College London, UK

09:40 - 10:00

FF1A-03 **EVENT DRIVEN TIME-LOGGING SYSTEM BASED ON CONTINUOUS OPERATION OF REAL TIME CLOCK TOWARDS PERPETUAL ELECTRONICS**

S. Yamada and H. Toshiyoshi

University of Tokyo, JAPAN

10:00 **Refreshment Break**

10:30 **Session F7 - Late News Oral Presentations**

11:50 **Award Ceremony**

12:10 **Conference Adjourns**

Poster Session A

Wednesday, December 5

15:50 - 17:50

St. John's – Halifax Room

APPLICATIONS AND INNOVATIONS IN MICRO ENERGY SYSTEMS

Energy-Autonomous Wireless Sensors for IoT

PW-01a ROBUST SELF-POWERED WIRELESS PLANT-MONITORING SENSOR SYSTEM WITH SAP-ACTIVATED BATTERY

S. Okamoto¹, R. Furumori¹, A. Tanaka¹, F. Utsunomiya², and T. Douseki¹

¹Ritsumeikan University, JAPAN and ²ABLIC Inc., JAPAN

Zero-Power Devices and Systems

PW-02a A MECHANICALLY TUNABLE GHZ PASSIVE VOLTAGE ELEMENT USING MICROSTRIP RESONATOR

D. Ni, A. Ravi, V. Kumar, and A. Lal

Cornell University, USA

BIOCHEMICAL AND BIO-INSPIRED POWER/ENERGY SYSTEMS

Biochemical and Bio-Inspired Power/Energy Systems

PW-03b A DIATOM INSPIRED NEAR INFRARED METAMATERIAL ABSORBER WITH HIERARCHICAL NANODISK ARRAYS

A. Li¹, X. Zhao¹, S. Anderson², and X. Zhang¹

¹Boston University, USA and ²Boston University Medical Center, USA

PW-04b ANODE BASED ON ALCOHOL DEHYDROGENASE ENZYME AND TITANIUM DIOXIDE NANOTUBES FOR PHOTOCATALYTIC MICROFLUIDIC DEVICE

J. Galindo-de-la-Rosa¹, G. González-Solano², J.A. Díaz-Real³,

J. Ledesma-García², and L.G. Arriaga¹

¹Centro de Investigación y Desarrollo Tecnológico en Electroquímica, MEXICO,

²Universidad Autónoma de Querétaro, MEXICO, and

³University of British Columbia, CANADA

PW-05b IMMOBILIZATION OF GLUCOSE OXIDASE ENZYME ON NIAL-LDHS FOR APPLICATION IN MICROFLUIDIC FUEL CELL AND SEROTONIN DETECTION

J. Galindo-de-la-Rosa¹, M.G. Araiza-Ramírez², A. Hernández-Torres²,

J. Ledesma-García², and L.G. Arriaga¹

¹Centro de Investigación y Desarrollo Tecnológico en Electroquímica, MEXICO

and ²Universidad Autónoma de Querétaro, MEXICO

DIRECT THERMAL ENERGY-HARVESTING

Thermoelectric Energy-Harvesting

PW-06c DEVELOPMENT OF THERMOELECTRIC THIN FILMS AND CHARACTERIZATION METHODS

T. Mori, T. Aizawa, S. Mitani, N. Tsujii, I. Ohkubo, T. Tynell, Y. Kakefuda, T. Baba, M. Mitome, N. Kawamoto, and D. Golberg
NIMS, JAPAN

PW-07c METAL-METAL THERMOELECTRIC HARVESTER

E. Köhler and P. Enoksson
Chalmers University of Technology, SWEDEN

PW-08c THERMAL TRANSPORT IN PRINTED THERMOELECTRIC MATERIALS

K. Miyazaki, K. Kuriyama, and T. Yabuki
Kyushu Institute of Technology, JAPAN

Other Energy-Harvesting

PW-09c ELECTRICAL MODELING AND CHARACTERIZATION OF A THERMO-MAGNETICALLY ACTIVATED PIEZOELECTRIC GENERATOR (TMAPG)

A. Rendon-Hernandez¹, M. Ferrari², S. Basrour¹, V. Ferrari²
Université Grenoble Alpes, FRANCE and ²University of Brescia, ITALY

ELECTRICAL ENERGY HARVESTING, MANAGEMENT, STORAGE AND TRANSFER

Batteries, Super-Capacitors, and Chemical Energy Storage

PW-10d OPTIMIZATION OF CARBON ELECTRODES FOR SOLID-STATE E-TEXTILE SUPERCAPACITORS

N. Hillier, S. Yong, and S. Beeby
University of Southampton, UK

Power Electronics and Energy Management Circuits

PW-11d A TUNABLE HYBRID SSHI STRATEGY FOR PIEZOELECTRIC ENERGY HARVESTING WITH ENHANCED OFF-RESONANCE PERFORMANCES

A. Morel¹, G. Pillonnet¹, and A. Badel²
¹CEA-LETI, FRANCE and ²Université Savoie Mont Blanc, FRANCE

PW-12d AN UP-CONVERSION MANAGEMENT CIRCUIT FOR ELECTRICAL FIELD ENERGY HARVESTER

Y.M. Wen, P. Li, T. Han, and X.J. Ji
Shanghai Jiao Tong University, CHINA

PW-13d POWER MANAGEMENT WITH DYNAMIC POWER ADAPTION FOR A ROTATIONAL ENERGY HARVESTER IN A MARITIME GEARBOX

J. Esch¹, D. Schillinger², D. Stojakov¹, D. Hoffmann¹, and Y. Manoli¹
¹Hahn-Schickard, GERMANY and ²University of Freiburg, GERMANY

RF, Inductive and Acoustic Power Transfer

PW-14d EXPERIMENTS ON A WIRELESS POWER TRANSFER SYSTEM FOR WEARABLE DEVICE WITH SOL-GEL THIN-FILM PZT

B.D. Truong¹, D. Wang², T. Xue¹, S. Trolier-McKinstry², and S. Roundy¹
¹University of Utah, USA and ²Pennsylvania State University, USA

PW-15d REDUCING HUMAN BODY HEATING AND TEMPERATURE RISES DUE TO INDUCTIVELY-POWERED IMPLANTABLE MEDICAL DEVICES

C.H. Kwan, D.C. Yates, and P.D. Mitcheson
Imperial College London, UK

ELECTRON, ION, PHOTON AND RADIATION ENERGY CONVERSION

Electron, Ion and Photon Sources

PW-16e MINIATURE, 3D-PRINTED, MONOLITHIC ARRAYS OF CORONA IONIZERS

Z. Sun, L. Fernando Velásquez-García
Massachusetts Institute of Technology, USA

GENERAL

Energy Conversion Physics

PW-17f GENERATION OF ASYMMETRIC TORQUE SIGNALS

L. Kurmann¹, and J.L. Duarte²
¹University of Freiburg, GERMANY and ²Eindhoven University of Technology, THE NETHERLANDS

MATERIALS FOR ENERGY CONVERSION

Fabrication Technology for Power/Energy Systems

PW-18g HIGH-RATE ETCHING OF SINGLE ORIENTED ALN FILMS BY CHLORINE-BASED INDUCTIVE COUPLED PLASMA FOR VIBRATIONAL ENERGY HARVESTERS

H.H. Nguyen, L.V. Minh, and H. Kuwano
Tohoku University, JAPAN

PW-19g USING GALISTAN TO FABRICATE POROUS GOLD ELECTRODES: TOWARD NON-ENZYMATIC GLUCOSE FUEL CELLS WITH ENHANCED PERFORMANCE FOR DRIVING WEARABLE/BIOELECTRONIC DEVICES

D. Desmaële¹, F. La Malfa^{1,2}, F. Rizzi¹, A. Qualtieri¹, M. Di Lorenzo³, and M. De Vittorio^{1,2}
¹IIT-CBN, ITALY, ²Universita del Salento, ITALY, and ³University of Bath, UK

Materials for Energy Conversion and Storage

PW-20g GRAPHENE-POROUS SEMICONDUCTOR NANOCOMPOSITES SCALABLE SYNTHESIS FOR ENERGY APPLICATIONS

A. Boucherif
Université de Sherbrooke, CANADA

PW-21g HYDROGEN EVOLUTION CATALYTIC PERFORMANCE OF METAL DOPED MOS₂

X. Leng, Y. Wang, and F. Wang

Southern University of Science and Technology, CHINA

MECHANICAL ENERGY HARVESTING AND ACTUATION

Mechanical Energy-Harvesting – Electromagnetic

PW-22h A CM-SCALE, LOW WIND VELOCITY AND 250°C-COMPLIANT AIRFLOW-DRIVEN HARVESTER FOR AERONAUTIC APPLICATIONS

P. Gasnier, J. Willemin, S. Boisseau, B. Goubault De Brugière, G. Pillonnet, B. Gomez, and I. Neyret

University Grenoble Alpes, CEA-Leti, FRANCE

PW-23h A MAGNETICALLY-SPRUNG NONLINEAR RESONATOR FOR WIDEBAND VIBRATION ENERGY HARVESTING CONSISTING OF MAGNETIC COMPOSITE AND RING MAGNETS

Y. Miyata, A. Masuda, F. Zhao, and S. Ushiki

Kyoto Institute of Technology, JAPAN

PW-24h INDUSTRY 4.0-TYPE WIRELESS SENSOR APPLICATION POWERED BY A SEMI-AUTOMATICALLY DESIGNED MINI-SCALE ELECTROMAGNETIC ENERGY HARVESTER

B. Leistritz, F. Senf, E. Chervakova, S. Engelhardt, and W. Kattaneck

IMMS Institut für Mikroelektronik- und Mechatronik-Systeme gemeinnützige GmbH, GERMANY

PW-25h MEMS POWER GENERATOR OPERATED BY FLUOROCARBON GAS

M. Kaneko, K. Kudo, K. Ebisawa, K. Tanaka, and F. Uchikoba

Nihon University, JAPAN

PW-26h PERFORMANCES OF A CM-SCALE WATER FLOW ENERGY HARVESTER IN REAL ENVIRONMENT FOR AUTONOMOUS FLOWMETERS

E. Saoutieff¹, P. Gasnier¹, S. Boisseau¹, J. Ojer-Aranguren², and I. Rodot³

¹*University Grenoble Alpes, CEA-Leti, FRANCE, ²NAITEC, SPAIN, and*

³*SERM, FRANCE*

PW-27h WEARABLE GENERATOR WITH ROTATING OSCILLATING MASS

M. Ortiz¹, E. Fenollal², B. Restrepo², A. Espinoza², and E. Romero³

¹*University of Puerto Rico, USA, ²Universidad del Turabo, USA, and*

³*Florida Polytechnic University, USA*

Mechanical Energy-Harvesting - Electrostatic

PW-28h DYNAMIC ANALYSIS OF ELECTROSTATIC ENERGY HARVESTING DEVICE WITH MULTI-STEP STRUCTURE

X. Guo, Y. Zhang, and F. Wang

Southern University of Science and Technology, CHINA

PW-29h NEMS ELECTROSTATIC RF WAKEUP SWITCH WITH PT FIB CONTACT

A. Ruyack, L. Pancoast, N. Shalabi, A. Molnar, and A. Lal

Cornell University, USA

Mechanical Energy-Harvesting – Piezoelectric

- PW-30h AGING ASSESSMENT OF PIEZOELECTRIC ENERGY HARVESTER USING ELECTRICAL LOADS**
T. Hoang, G. Ferin, C. Bantignies, B. Rosinski, P. Vince, and A. Nguyen-Dinh
Vernon S.A., FRANCE
- PW-31h EQUIVALENT CIRCUIT MODEL OF PIEZOELECTRIC VIBRATION ENERGY HARVESTERS COMPOSED OF TRAPEZOIDAL UNIMORPH CANTILEVERS**
T. Umegaki, T. Ito, G. Tan, and I. Kanno
Kobe University, JAPAN
- PW-32h INTEGRATION AND CHARACTERISATION OF PIEZOELECTRIC MACRO-FIBRE COMPOSITE ON CARBON FIBRE COMPOSITE FOR VIBRATION ENERGY HARVESTING**
Y. Shi, C. Piao, D. El Fadlaoui, A. Al-Saadi, and Y. Jia
University of Chester, UK
- PW-33h MEMS ENERGY HARVESTING BASED ON UNIFORM-STRESS CANTILEVER WITH MULTILAYER PZT THIN FILMS**
S. Hirai, K. Kanda, T. Fujita, K. Maenaka
University of Hyogo, JAPAN
- PW-34h OUTPUT POWER OF PIEZOELECTRIC MEMS VIBRATION ENERGY HARVESTERS UNDER RANDOM OSCILLATION**
S. Murakami¹, T. Yoshimura², M. Aramaki², Y. Kanaoka¹, K. Tsuda¹, K. Satoh¹, K. Kanda³, and N. Fujimura²
¹*Osaka Research Institute of Industrial Science and Technology, JAPAN,*
²*Osaka Prefecture University, JAPAN,* and ³*University of Hyogo, JAPAN*
- PW-35h REACTIVE ION BEAM ETCHING OF PIEZOELECTRIC SCALN FOR BULK ACOUSTIC WAVE DEVICE APPLICATIONS**
R. James, Y. Pilloux, and H. Hegde
Plasma Therm, USA

Mechanical Energy-Harvesting - Triboelectric

- PW-36h TRIBOELECTRIC EFFECT TO HARNESS FLUID FLOW ENERGY**
R. Haque, A. Arafat, D. Briand
École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND

Mechanical Energy-Harvesting - Other

- PW-37h UPPER BOUND FOR THE POWER OUTPUTS OF LINEAR VIBRATIONAL POWER HARVESTERS: TRANSLATIONAL VS. ROTATIONAL GEOMETRIES**
A. Ananthakrishnan and I. Bargatin
University of Pennsylvania, USA

Motors/Generators, Pumps and Actuators

PW-38h DETERMINATION OF MECHANICAL ACTUATION FORCE GENERATED BY GROWING SEED IN INKJET 3D PRINTED MICRODEVICE

R. Walczak

Wroclaw University of Science and Technology, POLAND

PW-39h STABILITY OF SYMMETRICAL COMB-DRIVE ACTUATOR

A. Galisultanov¹, G. Pillonnet¹, Y. Perrin¹, L. Hutin¹, P. Basset², and H. Fanet¹

¹CEA, FRANCE and ²ESIEE, FRANCE

THERMAL AND CHEMICAL SCIENCE AND TECHNOLOGIES FOR POWER, PROPULSION, AND COOLING

Fuel Cells, Reactors, and Combustors

PW-40i DYNAMICS OF DIRECT HYDROCARBON PEM FUEL CELLS

E.H. Kong, P.D. Ronney, and G.K. Surya Prakash

University of Southern California, USA

PW-41i IMPROVED SENSITIVITY OF THIN FILM SENSOR FOR HUMIDITY MEASUREMENT INSIDE A OPERATING PEMFC

N. Hasegawa, Y. Otsuki, M. Kurosu, and T. Araki

Yokohama National University, JAPAN

Poster Session B

Thursday, December 6

15:50 - 17:30

St. John's – Halifax Room

APPLICATIONS AND INNOVATIONS IN MICRO ENERGY SYSTEMS

Energy-Autonomous Wireless Sensors for IoT

PT-01a MINIMIZING POWER CONSUMPTION OF LORA® AND LORAWAN FOR LOW-POWER WIRELESS SENSOR NODES

E. Bäumker, A. Miguel Garcia, and P. Woias
University of Freiburg, GERMANY

PT-02a A NARROW-BAND AND ULTRA-LOW-POWER 433 MHZ WAKE-UP RECEIVER

S. Koeble, S. Heller, and P. Woias
Albert-Ludwig-University Freiburg, GERMANY

BIOCHEMICAL AND BIO-INSPIRED POWER/ENERGY SYSTEMS

Biochemical and Bio-Inspired Power/Energy Systems

PT-03b A PAPERTRONIC SENSING SYSTEM FOR RAPID VISUAL SCREENING OF BACTERIAL ELECTROGENICITY

M. Tahernia, M. Mohammadifar, and S. Choi
State University of New York, Binghamton, USA

PT-04b GLUCOSE OXIDASE BIOELECTRODES IN DEVICES IMPLANTED IN LIVING PLANTS FOR ENERGY APPLICATIONS

J. Galindo-de-la-Rosa¹, A. Hernández-Torres², M.G. Araiza-Ramírez²,
A. Alvarez², L.G. Arriaga¹, and J. Ledesma-García²

¹*Centro de Investigación y Desarrollo Tecnológico en Electroquímica, MEXICO*
and ²*Universidad Autónoma de Querétaro, MEXICO*

PT-05b MICROFLUIDIC BIOFUEL CELL BASED ON CHOLESTEROL OXIDASE/LACCASE ENZYMES

J. Galindo-de-la-Rosa¹, E. Ortiz-Ortega¹, B. López-González¹, L.G. Arriaga¹, and
J. Ledesma-García²

¹*Centro de Investigación y Desarrollo Tecnológico en Electroquímica, MEXICO*
and ²*Universidad Autónoma de Querétaro, MEXICO*

DIRECT THERMAL ENERGY-HARVESTING

Thermoelectric Energy-Harvesting

PT-06c IMPROVED MICRONANOGENERATORS BASED ON SILICON COMPATIBLE MATERIALS AND PROCESSING

I. Donmez¹, M. Dolcet¹, A. Stranz¹, M. Salleras¹, L. Fonseca¹, G. Gadea²,
M. Pacios², A. Morata², and A. Tarancon²

¹*IMB-CNM (CSIC), SPAIN* and ²*IREC, SPAIN*

PT-07c MILLIWATT POWER SUPPLY BY DYNAMIC THERMOELECTRIC HARVESTING
M.E. Kiziroglou¹, S.W. Wright¹, M. Shi¹, D. Boyle¹, T.H. Becker², J. Evans³,
and E.M. Yeatman¹
¹Imperial College London, UK, ²Natural Science and Technical Academy Isny, GERMANY, and ³University of California, Berkeley, USA

PT-08c THIN-FILM π TYPE MICRO TEG USING VACUUM/INSULATOR-HYBRID ISOLATION WITH CONVEX-SHAPE HOT-PLATE MODULE STRUCTURE FOR WEARABLE DEVICE APPLICATIONS
Y. Shiotsu, T. Seino, N. Chiwaki, and S. Sugahara
Tokyo Institute of Technology, JAPAN

ELECTRICAL ENERGY HARVESTING, MANAGEMENT, STORAGE AND TRANSFER

Batteries, Super-Capacitors, and Chemical Energy Storage

PT-09d DEVELOPMENT OF A FLEXIBLE SPEEK SUPERCAPACITOR AS ELECTROLYTE AND SEPARATOR
R. López Mayo¹, A. Rico-Zavala¹, J. Ledesma-García², L.G. Arriaga¹,
and M.P. Gurrola¹
¹Centro de Investigación y Desarrollo Tecnológico en Electroquímica, MEXICO and ²Universidad Autónoma de Querétaro, MEXICO

Power Electronics and Energy Management Circuits

PT-10d A HIGH-EFFICIENCY MANAGEMENT CIRCUIT FOR PIEZOELECTRIC ENERGY HARVESTER
P. Li, Y.M. Wen, T. Han, and X.J. Ji
Shanghai Jiao Tong University, CHINA

PT-11d A VOLTAGE-BOOST RECTIFIER CIRCUIT FOR ENERGY HARVESTING FROM ENVIRONMENTAL VIBRATIONS
Y. Tohyama¹, H. Honma¹, N. Ishihara², H. Sekiya³, H. Toshiyoshi¹,
and D. Yamane²
¹University of Tokyo, JAPAN, ²Tokyo Institute of Technology, JAPAN, and ³Tokyo City University, JAPAN

PT-12d DESIGN OF A MEMS RELAY BASED ON SOI FABRICATION TECHNOLOGY
M. Schwarz¹, F. Lambrecht¹, A. Bauer¹, and H. Seidel²
¹Siemens AG, GERMANY and ²Saarland University, GERMANY

PT-13d SECONDARY SIDE DE-TUNING TO ENABLE WIDE-RANGE INDUCTIVE POWER TRANSFER FOR A WRIST WORN SENSOR
S.G. Burrow^{1,2} and L.R. Clare^{1,2}
¹Trameto, UK and ²University of Bristol, UK

RF, Inductive and Acoustic Power Transfer

PT-14d MAGNETIC PENDULUM ARRAYS FOR EFFICIENT WIRELESS POWER TRANSMISSION

S.P. Mysore Nagaraja¹, R.U. Tok¹, R. Zhu², S. Bland³, A. Propst³, Y.E. Wang¹
¹University of California, Los Angeles, USA, ²Axend Inc, USA, and
³Nextgen Aeronautics, USA

PT-15d SIMULATION AND MODELING OF A ROBUST WIRELESS TRANSFER SYSTEM IN 3-D SPACE FOR MULTI-USER CHARGING

H. Wang¹, X. Wang², J.H. Lang², and J.L. Kirtley²
¹Tsinghua University, CHINA and ²Massachusetts Institute of Technology, USA

GENERAL

Energy Conversion Physics

PT-16f FEASIBILITY OF A V-SHAPED MAGNET ROTOR TO CONVERT VIBRATION INTO ROTATION

D.J. Clarkson¹, L. Kurmann², G.N. Moubarak¹, and Y. Jia¹
¹University of Chester, UK and ²University of Freiburg, GERMANY

MATERIALS FOR ENERGY CONVERSION

Fabrication Technology for Power/Energy Systems

PT-17g FACILE FABRICATION OF SILICON MICRO/NANOSTRUCTURES FOR MICROELECTRODES BY SILVER-ASSISTED ETCHING USING NANOSPONGE AS A TEMPLATE

Y.Q. Chen, J. Ruan, J.H. Huang, L.M. Qian, and S.L. Jiang
Southwest Jiaotong University, CHINA

PT-18g LASER-BONDING OF FEP/FEP INTERFACES FOR A FLEXIBLE MANUFACTURING PROCESS OF FERROELECTRETS

D. Flachs, F. Emmerich, G.-L. Roth, R. Hellmann, and C. Thielemann
University of Applied Sciences Aschaffenburg, GERMANY

Materials for Energy Conversion and Storage

PT-19g ETHANOL TOLERANT CATALYST BASED IN PLATINUM AND SILVER IN GRAPHENE

M.J. Estrada-Solis¹, B. López-González¹, M. Guerra-Balcazar²,
and F.M. Cuevas-Muñiz¹
¹Centro de Investigación y Desarrollo Tecnológico en Electroquímica, MEXICO
and ²Universidad Autónoma de Querétaro, MEXICO

PT-20g HIGHLY ORIENTED AND STRESS MODIFIED THICK ALN FILMS DEPOSITED ON LOW THERMAL EXPANSION ALLOY SUBSTRATES FOR FLEXIBLE ELECTRONICS IN HARSH ENVIRONMENT

N. Moriwaki^{1,2}, L.V. Minh¹, and H. Kuwano¹
¹Tohoku University, JAPAN and ²Dai Nippon Printing Co., Ltd., JAPAN

- PT-21g PLD ELECTRODES IN A COUPLED MICROFLUIDIC FUEL CELL TO A LAB ON A CHIP SYSTEM FOR ENERGY GENERATION**
B. López-González¹, J.C. Abrego-Martínez², B.S. Hernández-Sarmiento³,
A. Moreno-Zuria², Y. Wang², M. Mohamedi², F.M. Cuevas-Muñiz¹,
and L.G. Arriaga¹
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²INRS, CANADA, and ³Instituto Tecnológico de Oaxaca, MEXICO

MECHANICAL ENERGY HARVESTING AND ACTUATION

Mechanical Energy-Harvesting - Electromagnetic

- PT-22h A COMPACT ELECTROMAGNETIC VIBRATION ENERGY HARVESTER WITH HIGH OUTPUT VOLTAGE**
X.C. Wang, X.F. He, K.K. Li, and S.L. Jiang
Chongqing University, CHINA
- PT-23h HEATING PERFORMANCE BY AN INSOLE ENERGY HARVESTER**
M.M. Rahman, S. Noh, K.H. Kim, and H. Kim
University of Utah, USA
- PT-24h INFLUENCES OF FE-GA ALLOY CRYSTALLINITY FOR THE APPLICATION TO A MAGNETOSTRICTIVE VIBRATION ENERGY HARVESTER**
M. Ito¹, T. Minamitani², and T. Ueno²
¹Central Research Institute of Electric Power Industry, JAPAN and
²Kanazawa University, JAPAN
- PT-25h PENDULUM BASE 3D PRINTED ELECTROMAGNETIC ENERGY HARVESTER**
K. Adamski
Wroclaw University of Science and Technology, POLAND
- PT-26h SYSTEMATIC COMPARISON OF BASIC STRUCTURES FOR ELECTROMAGNETIC ENERGY HARVESTERS USING AN AUTOMATED DESIGN METHODOLOGY**
B. Leistritz and W. Kattanek
IMMS Institut für Mikroelektronik- und Mechatronik-Systeme
Gemeinnützige GmbH, GERMANY

Mechanical Energy-Harvesting - Electrostatic

- PT-27h DEMONSTRATION OF AN ELECTRET GENERATOR USING SELF ASSEMBLED ELECTRET FOR ENERGY HARVESTING WITHOUT ANY CHARGING PROCESS**
N. Matsuura, H. Ishii, and Y. Tanaka
Chiba University, JAPAN
- PT-28h INVESTIGATION OF PARALLEL-CONNECTED MEMS ELECTROSTATIC ENERGY HARVESTER FOR ENHANCING OUTPUT POWER OVER A WIDE FREQUENCY RANGE**
J. Li, X. Tong, J. Oxaal, Z. Liu, M. Hella, and D. Borca-Tasciuc
Rensselaer Polytechnic Institute, USA

PT-29h TEXTILE BASED FERROELECTRET FOR WEARABLE ENERGY HARVESTING

J. Shi and S.P. Beeby
University of Southampton, UK

Mechanical Energy-Harvesting - Piezoelectric

PT-30h A 120°C 20G-COMPLIANT VIBRATION ENERGY HARVESTER FOR AERONAUTIC ENVIRONMENTS

P. Gasnier¹, M. Boucaud², M. Gallardo¹, J. Willemin¹, A. Morel¹, D. Gibus¹, M. Moreau³, and S. Boisseau¹
¹*University Grenoble Alpes, CEA-Leti, FRANCE*, ²*Abylsen, FRANCE*, and ³*SAFRAN Power Units, FRANCE*

PT-31h AN UMBRELLA-SHAPED TOPOLOGY FOR BROADBAND MEMS PIEZOELECTRIC VIBRATION ENERGY HARVESTING

Y. Jia¹, S. Du², and A. Seshia²
¹*University of Chester, UK* and ²*University of Cambridge, UK*

PT-32h INCREASED PIEZOELECTRIC COUPLING FORCE IN AUTOPARAMETRIC EXCITATION HARVESTER CONNECTING TO SELF-POWERED SERIES AND PARALLEL SYNCHRONIZED SWITCH HARVESTING ON INDUCTOR (SSHI) INTERFACES

H. Asanuma, T. Komatsuzaki, and Y. Iwata
Kanazawa University, JAPAN

PW-33h MEMS ENERGY HARVESTER WITH TUNGSTEN PROOF-MASS

E. Köhler¹, P. Johannisson², D. Kolev², F. Ohlsson², P. Ågren³, J. Liljeholm³, P. Enoksson¹, and C. Rusu²
¹*Chalmers University of Technology, SWEDEN*, ²*RISE Acreo, SWEDEN*, and ³*Silex Microsystems, SWEDEN*

PT-34h OMNIDIRECTIONAL LOW FREQUENCY ENERGY HARVESTER FOR WEARABLE APPLICATIONS

C. Ou, V. Pinrod, B. Davaji, and A. Lal
Cornell University, USA

PT-35h POLYMER-BASED PIEZOELECTRIC ENERGY HARVESTER FOR LOW-FREQUENCY VIBRATION USING FREQUENCY UP-CONVERSION DRIVEN BY COLLISION WITH A FLEXIBLE BEAM

T. Tsukamoto¹, Y. Umino¹, K. Hashikura¹, S. Shiomi¹, K. Yamada¹, and T. Suzuki^{1,2}
¹*Gunma University, JAPAN* and ²*Japan Science and Technology Agency (JST), JAPAN*

PT-36h TEXTILE-BASED FREESTANDING TRIBOELECTRIC-LAYER NANOGENERATOR WITH ALTERNATE POSITIVE AND NEGATIVE GRATING STRUCTURE

W. Paosangthong, R. Torah, and S. Beeby
University of Southampton, UK

Mechanical Energy-Harvesting - Triboelectric

PT-37h WEARABLE TRIBOELECTRIC GENERATOR BASED ON A HYBRID MIX OF CARBON NANOTUBE AND POLYMER LAYERS

M. Su¹, J. Brugger², and B.J. Kim¹

¹*Universtiy of Tokyo, JAPAN and*

²*École Polytechnique Fédérale de Lausanne (EPFL), SWITZERLAND*

Motors/Generators, Pumps and Actuators

PT-38h MACROSCOPIC ACTUATION FOR DEPLOYABLE MICROVALVES: COUPLING MECHANICALLY WHILE ISOLATING THERMALLY

C. Kelly, X. Xie, A. Dodge, and C. Livermore

Northeastern University, USA

THERMAL AND CHEMICAL SCIENCE AND TECHNOLOGIES FOR POWER, PROPULSION, AND COOLING

Fuel Cells, Reactors, and Combustors

PT-39i A PD/AL₂O₃-BASED MICRO-REFORMER UNIT FULLY INTEGRATED IN SILICON TECHNOLOGY FOR H-RICH GAS PRODUCTION

M. Bianchini¹, N. Alayo¹, L. Fonseca², M. Salleras², L. Soler³, J. Llorca³, and A. Tarancon^{1,4}

¹IREC, SPAIN, ²IMB-CNM CSIC, SPAIN, ³INTE, SPAIN, and ⁴ICREA, SPAIN

PT-40i EXPERIMENTAL AND NUMERICAL INVESTIGATION OF MICRO CATALYTIC REACTOR FOR AUTOTHERMAL REFORMING USING METHANOL AND HYDROGEN PEROXIDE WITH BUILT-IN CHROME SILICIDE THERMOCOUPLE

E.S. Jung

Pusan National University, KOREA

PT-41i USEFULNESS AND PERFORMANCE COMPARISON OF COMPLEX ENZYME-TYPE BIOFUEL CELL USING ELECTRODE MODIFIED WITH TWO DET-TYPE ENZYMES BY COVALENT BONDING

H. Fujita, Y. Nishioka, and S. Imai

Nihon University, JAPAN