

Session 26 - Sensors, MEMS, and Bioelectronics - Integrated Energy Devices and Sensors

Tuesday, December 10, 2:15 p.m.

Imperial Ballroom B

Co-Chairs: A. Tixier-Mita, University of Tokyo

X. Wang, Tsinghua University

2:20 PM 26.1 Millimeter Scale Thin Film Batteries for Integrated High Energy Density Storage
Sami Oukassi, Arnaud Bazin, Christophe Secouard, Isabelle Chevalier, Severine Poncet, Sylvain Poulet, Jean-Marc Boissel, Françoise Geffraye, Jean Brun, Raphaël Salot, CEA-Leti

We successfully fabricated miniaturized TFBs integrating 20 μ m thick positive electrode for the first time. Our devices exhibit the best performances, reaching discharge capacity of 0.8mAh/cm². The fabrication process is viable for industrial large-scale production. our TFBs have strong potential as integrated energy storage units, in particular for medical applications.

2:45 PM 26.2 Beyond Electrolytic Capacitor: High Frequency On-chip Micro Supercapacitor with Large Capacitance Density
Sixing Xu, Fan Xia, Xiaohong Wang, Tsinghua University, Tsinghua National Laboratory for Information Science and Technology

We report on high-frequency micro supercapacitors (MSC) with ultra-high capacitance and chip integratability. Contributed by 3D mesoporous electrodes and novel MXene quantum dots, 9.7/34.2 times of areal/volume capacitance higher than commercial electrolytic capacitors are obtained. The MSC is used in low-pass filtering circuits, showing great advantage in circuit size reduction.

3:10 PM 26.3 Device Engineering for Diamond Quantum Sensors (Invited)
Mutsuko Hatano, T. Iwasaki, Tokyo Institute of Technology

Nitrogen-Vacancy centers in diamond have superior physical properties at room temperature for quantum sensing. We will review the sensor materials, quantum control technology, and applications. The perfectly-aligned NV ensemble formed by CVD-growth can provide high sensitivity. For applications, we will introduce biological imaging, nano-scale NMR, and internal device sensing.

3:35 PM 26.4 Efficient Integration of Si FET-type Gas Sensors and Barometric Pressure Sensors on the Same Substrate
Dongkyu Jang, Gyuweon Jung, Yujeong Jeong, Yoonki Hong, Seongbin Hong, Wonjun Shin, Ki Soo Chang, Chan Bae Jeong, Byung-Gook Park, Jong-Ho Lee, Seoul National University, Samsung Electronics, Korea Basic Science Institute

We propose Si FET-type gas sensors and barometric sensors that can be efficiently integrated on the same substrate. The gas sensor has a localized micro-heater capable of heating up to 124°C. The barometric sensor has a built-in temperature sensor that can simultaneously measure temperature and pressure.

4:00 PM COFFEE BREAK

4:25 PM 26.5 A Large-area Curved Pyroelectric Fingerprint Sensor
Jean-François Mainguet, Didier Gallaire, Audrey Martinent, Amélie Revaux, Mohammed Benwadih, Simon Charlot, Albert Breemen, Jan-Laurens van der Steen, Hylke Akkerman, Auke Kronemeijer, Gerwin Gelinck, Marina Pouet, Joël-Yann Fourre, Stefano Sinopoli, Umberto Emanuele, Lionel Fritsch, Judith Liu

Jimenez, Johan Karlsson, Florian De Roose, Soeren Steudel, CEA-Leti, imec, Netherlands Organisation for Applied Scientific Research (TNO), Idemia, Bioage, Irlinx, Universidad Carlos III de Madrid, Autoliv

We show a thin, flexible and large 500 dpi fingerprint sensor providing better usability than existing sensors with a similar performance. A new process flow, using PVDF-TrFE capacitors on top of an IGZO TFT backplane on a flexible polyimide foil is implemented to create an active thermal fingerprint sensor.

4:50 PM 26.6 Ultrasensitive Flexible Strain Sensor based on Two-Dimensional InSe for Human Motion Surveillance

Li Chen, Dan Liang, Zhigen Yu, Sifan Li, Xuwei Feng, Bochang Li, Yesheng Li, Yongwei Zhang, Kah-Wee Ang, National University of Singapore, A*STAR IHPC

We firstly demonstrate a flexible InSe-based strain sensor for human motion surveillance. Our work reveals a highly tunable piezoresistive effect and low Young's modulus in InSe that is promising for realizing ultrasensitive human motion sensors, and the performance can be further enhanced *via* gating effect using a three-terminal device configuration.