PURDUE INNOVATES | Office of Technology Commercialization

Methods and Measurements to for Combined Chemo-thermo-mechanical Measurements of Properties in Nanoscale to mm Devices

Spectral tomography provides high-accuracy, in situ performance measurements for nanoscale devices operating in extreme environments, enabling better characterization for applications in nanoelectronics, alternative energy, and biotechnology.

Applications of nanoscale devices with exposure to extreme environments suffer from a lack of characterization methods capable of offering in situ performance measurements.

Researchers at Purdue University have developed a technique called spectral tomography to address this issue. This technique uses spatial and temporal non-contact measurements of mechanochemistry in material systems. Predicting mechanical and thermal properties of extreme-scale electronics in high-temperature energy systems, such as nuclear energy and hypersonic air vehicles, measuring thermal cycling and charge-discharge cycle induced dielectric breakdown with corresponding life-cycle failure, e.g., Li-ion battery technology, and transferring in vitro measurements to in vivo measurements/observations are a few of the capabilities of this technology. It offers resolution, temperature, and environment dependence accuracy not currently possible in commercial use. This technology's potential use includes nanoelectronics, alternative energy, and biotechnology.

Advantages:

-Allows for in situ performance measurements

-Transfers in vitro measurements to in vivo measurements/observations

-Offers resolution, temperature and environment dependence accuracy

Potential Applications:

Technology ID
2014-TOMA-66742

Category
Aerospace & National Security/Hypersonics & Propulsion Systems
Materials Science & Nanotechnology/Nanomaterial Characterization & Imaging Tools
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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View online

-Nanoelectronics

-Alternative Energy

-Biotechnology

TRL: 6

Intellectual Property:

Provisional-Patent, 2014-07-16, United States | Utility Patent, 2015-07-15, United States

Keywords: spectral tomography, nanoscale devices, extreme environments, in situ performance measurements, spatial and temporal non-contact measurements, mechanochemistry, high-temperature energy systems, thermal cycling, dielectric breakdown, nanoelectronics, alternative energy, biotechnology