Access provider – CEA-Liten

Energy Harvesting - Access description

Access to thermoelectric energy harvesting facilities and expertise, including test structures, processing and characterization infrastructure at CEA-Liten.

Technical offering

- Thermoelectric materials microstructure analysis (X-ray diffraction and Scanning Electronic Microscopy).
- Bulk thermoelectric materials characterization (cross-plane and in-plane properties): Seebeck coefficient, electrical properties (electrical resistivity, mobility and carriers concentration) and thermal properties (diffusivity, specific heat and thermal conductivity).
- Thin films thermoelectric materials characterization:
    - In-plane properties: Seebeck coefficient and electrical properties (electrical resistivity, mobility and carriers concentration).
    - Cross-plane properties: thermal conductivity.
- Characterization of thermoelectric devices in controlled atmosphere (air, inert gas or vacuum): measurement of electrical resistance, output voltage and power. Devices failure analysis.

Main equipment

- ZEM3 and ZEM5 ULVAC GmbH equipment:
    - Measurement of bulk materials Seebeck coefficient and electrical resistivity (from room temperature up to 700 °C).
    - Measurement of thin films Seebeck coefficient and electrical resistivity (from room temperature up to 200 °C).
- LFA 457 MicroFlash®, Netzsch-Gerätebau GmbH: bulk materials thermal diffusivity with a laser-flash method (from 50 to 1000 °C).
- DSC 404 F1 Pegasus, Netzsch-Gerätebau GmbH: bulk materials specific heat with a differential scanning calorimetry (from 50 to 1200 °C).
- ProberTE: measurement of thin films materials thermal conductivity by 3ω method (from room temperature up to 300 °C).

- SCANTEG600: dedicated test bench for thermoelectric devices properties (electrical resistivity, output voltage and power generated) with a large temperature gradient (up to 773 K on the hot side, between 273 and 373 K on the cold one) on a module in a controlled atmosphere (tests can be done during hundreds of hours or cycling).

Typical applications

Development of thermoelectric materials and devices usable for energy harvesting or sensing. Thermoelectric generators can be used as an energy source for IoT. Thermoelectric sensors can be used for heat flow measurements, thermal mapping or monitoring.

Case study

An SME or research team are developing new materials or devices for thermoelectric applications but they need access to characterization equipment to measure their properties. EnABLES will provide the possibility to measure these properties (measurement made by CEA people, customers can be present).

Responsible

Dr Guillaume Savelli

		
ZEM5 ULVAC GmbH	**SCANTEG600**	**ProberTE**
Keys specifications		
• 100 °C up to 700 °C • He atmosphere	• up to 773 K on the hot side • between 273 and 373 K on the cold one • atmosphere condition: air, inert gas or vacuum	• room temperature up to 200 °C • Air atmosphere