

The Emerging Technologies Research Centre

Micro and nano electronic solutions for the energy, health, nano science and technology industries

The **Emerging Technologies Research Centre (EMTERC)** focuses on both micro and nano electronics. These range from fundamental materials research (fabricating novel materials, understanding basic physical mechanisms), to investigating device applications in power electronics and display technologies.

Mission

EMTERC's goal is to build continually on its international reputation as a centre of excellence in micro and nano electronics, and their applications through the creation and exploitation of knowledge in materials and devices.

Background

EMTERC was established in 1995 to conduct fundamental and applied research in microelectronics nationally and internationally through strong teamwork and collaborations with other major universities and industrial partners. More recently, the Centre has demonstrated significant developments in the areas of nanoscience and nanotechnology. Micro and nanotechnology are and will be at the heart of virtually all technological developments from renewable energy systems to the mobile telecommunications infrastructure. In this regard, EMTERC is involved in activities that range from the production of bespoke materials, the design of the devices themselves through to their integration in end-user systems.

Expertise

EMTERC view micro and nano electronics and their applications as a value chain that starts with the materials and devices, progressing through to the way these devices are used by the industrial or commercial end-user. The research themes that make up EMTERC's activities are:

- Energy (photovoltaics, power electronic devices, etc)
- Healthcare
- Organic electronics
- Low temperature large area electronics
- Printable and flexible electronics
- Electronic memory devices
- Nano materials and devices
- Semiconductor device and process modelling



Facilities

The EMTERC facilities are grouped into four laboratories:

- **TCAD Modelling:** 20 node high performance server with semiconductor device and process modelling software, Synopsys Sentaurus TCAD
- **Device fabrication:** A clean room (with Class 100 under the benches), a double-sided EVG 620 mask aligner with 1 micron alignment capability and wet / dry benches, three deposition chamber PECVD/RIE system, Langmuir-Blodgett trough for molecules and nano particles deposition, spin-coater, dip-coater, RF/DC magnetron sputtering, evaporators, vertical stack furnaces.
- **DC and RF electronic characterization:** Including four wafer-level probe chucks for temperatures ranging from room temperature to 800 K. These are supported by HP4884 (an LCR bridge), HP4142B (modular DC source / monitor), HP4140B (pico-ammeter), a Lot Oriel solar simulator and ancillary systems. A deep level transient spectroscopy (DLTS) and high frequency S-parameter measurements.
- **Metrology:** Scanning probe microscope (SPM) (up to 473 K) with numerous measuring modes including: atomic force microscopy (AFM), scanning tunneling microscopy (STM) and electric force microscopy, plus further electrical, capacitance and magnetic modes; Scanning electron microscopy for sample inspection down to ~ 30nm.

Emerging Technology Research Centre can offer:

The primary expertise of EMTERC is in the areas of semiconductor materials, processes and devices. We can offer a variety of services from basic material characterisation to full device and process development, including modelling and optimisation of semiconductor devices. In addition, we have vast expertise in thin film deposition and we can deposit various organic and inorganic layers on the substrate of your choice.

Key Collaborations

Collaboration with industry and other academics is highly valued by EMTERC. The sharing and challenging of ideas, exposure to new problems and the pooling of expertise have been major contributors in the successes that we have had. Some of our current collaborations include:

Academic

- Ruhr-Universität Bochum (Germany)
- Kings College London
- Wrocław University of Technology
- Rutgers University (USA)
- Penn State (USA)

Industrial

- National Physical Laboratory (UK)
- IMEL/ NCSR Demokritos (Greece)

Research Grants and Projects (current and recently completed)

- Automotive Products for High temperature Requirements Offered by Device Innovation and Technology Enhancements' (APHRODITE) (On Semiconductor)
- Nanoscale Re-writable Non-Volatile Polymer Memory Arrays (EPSRC)
- Electrical Charging Nanobits (NPL)
- Poly-Silicon Solar Cell
- Organic Photovoltaic solar cell
- Plastic Compatible Electronic Memory Devices
- Low-temperature Si Nonvolatile memory- European Integrated Activity of Excellence and Networking for Nano and Micro- Electronics Analysis (ANNA) (FP6)

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