

### Brief description of the Department:

The Budapest University of Technology & Economy is the leading educational and research institution in the field of Engineering in Hungary. The Department of Electron Devices with about 20 highly qualified researchers is a highly reputed educational and research centre in microelectronics.

This is the only department in the Hungarian higher education, where research and education is carried out in the field of the theory of semiconductor devices, VLSI electronics (microelectronics), CAD of

VLSI microelectronics; in the field of semiconductor sensors and integrated microsystems. A special focus of activity of the department is related to the thermal issues of microelectronics and microsystems. In this area our department is one of the best known research centres in Europe and world-wide. Our mission is to continue the high level research efforts as well as our educational activities in the above mentioned areas.

### Main research activities:

In the field of micro & nanotechnologies our main efforts relate to Package Inside thermal monitoring, using either thermal test dies or liquid crystal on-line thermal monitoring; as well as MEMS-Chip on-line temperature monitoring. Other MEMS related research subjects are: MEMS electro-thermal simulation algorithm and program development and fast and user friendly MEMS electro-static simulator development.

Our other research efforts in micro- and nanotechnologies refer to the semiconductor process technologies. The characterization of semiconductor surfaces and very thin oxides includes the work function measurements on solid surfaces by vibrating capacitor (Kelvin) method, the development of the scanning version of the

vibrating capacitor method for surface potential and surface state density mapping of silicon wafers and the measurement of the light-induced surface potential transients on Si surfaces, covered by ultra thin (tunnel) oxide.

Further fields are the investigation of catalytically activated semiconductor gas sensors, the generation of olfactory images from the surface potentials measured on the gas sensitive surfaces, the development of semiconductor (tin-dioxide) sensors and the investigation of nanocrystals produced by agglomeration of ultra thin metal layers for activating semiconductor sensors. New high-k gate dielectric and other tunnel-oxide devices and different solar cells materials are investigated as well.

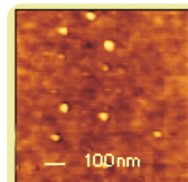
### Some further microsystem related research activity in progress:

- Investigation of micro-channel cooling devices
- Combined optical-thermal characterization tool and methodology development
- Design for testability of MEMS structures
- Development of a methodology to detect die attach and other package and MEMS integrity failures with transient thermal testing.

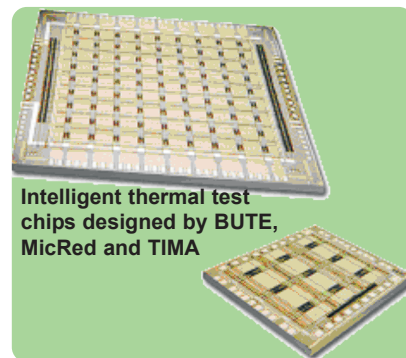
### Participation in different European projects in FP 5:

**BARMINT:** Basic Research for Microsystems Integration (1994-1997)  
**THERMINIC:** New Methods for Thermal Investigation of Integrated Circuits (1995-98)  
**HIPERLOGIC:** Thermal MOPs per milliwatt CMOS High Performance Logic (1996-99)  
**TALENT:** Tools Adoption and Library Development towards Microsystem Design Environment (1998-2000)  
**DETERMIN:** Development of Tools and Expertise for Thermal Investigation of ICs and Microsystems (1998-2001)  
**PROFIT:** Prediction of Temperature Gradients Influencing the Quality of Electronic Products (200-2002)  
**NEXUSEAST-NEXUSPAN:** Network of Excellence in Multifunctional Microsystems (1994-2000)  
**REASON:** Research and Training Action for System on Chip Design (2001)

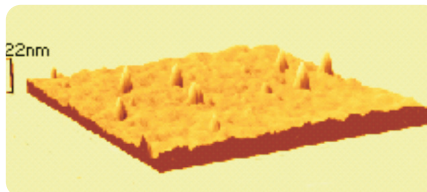
### Participation in FP 6:



Agglomeration of a  $\text{SnO}_2+\text{Au}$  layered structure



Intelligent thermal test chips designed by BUTE, MicRed and TIMA



AFM pictures from the sputtered (35 sec) layer

**PATENT:** Design for Micro&Nano Manufacture (DfMM), 2004

**MINAEAST NET:** Micro & NANotechnologies going to EASTern Europe through NETworking, 2004



Dr. Marta Rencz

**Dr. Marta Rencz**  
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Marta Rencz received the electrical engineering degree and the Ph.D. degree from the Technical University of Budapest, Hungary.

She is an associate professor at the Technical University of Budapest, and the CEO of Micred Ltd.

Her latest research interests include the thermal investigation of ICs and MEMS, thermal sensors, thermal testing, thermal simulation, thermal model generation, electro-thermal simulation.

She is a member of IEEE and IMAPS.

She is Organizing Committee and Program Committee member of several international conferences and workshops. She has published her theoretical and practical results in more than 200 technical papers.