

Research facilities in YITAL, Marmara Research Center, TÜBİTAK, Turkey

Photoresist processing workbench



**YITAL** is a part of the Marmara Research Center in Gebze outside of Istanbul, which is one of the R&D centers belonging to TÜBİTAK (Scientific and Technological Research Council of Turkey). YITAL was founded in 1981 and is today probably the leading CMOS ASIC production facility in Turkey.

**Facilities**

**YITAL** has today environments dedicated for class 1000, 100 as well as class 10 clean room work. There is a fully equipped laboratory for CMOS production – including a scanning electron microscope and diffusion furnaces - with 0,7µm CMOS processes being the standard since several years. Recently a new stepper have made possible 0,3 µm processes.



Scanning electron microscope



TUBITAK-UEKAE, P.O. Box: 74, 41470 GEBZE - KOCAELI  
e-mail: uekae@uekae.tubitak.gov.tr; [www.uekae.tubitak.gov.tr/en/mikroelek.htm](http://www.uekae.tubitak.gov.tr/en/mikroelek.htm)

Center of Excellence in Solar Cell Materials, Estonia

Tallinn University of Technology (TUT), Department of Materials Science, Thin films research group. Head of the group: Prof. Malle Krunks

**Research area: Thin films by wet chemical methods for photovoltaics and electronics**

**Group members**

*Deposition techniques:* spray pyrolysis, chemical bath deposition, sol gel, SILAR  
*Supporting techniques:* RF magnetron sputtering, PVD, plasma etching  
*Thin film materials:* Oxides (ZnO, TiO<sub>2</sub>), chalcogenides (CdS, ZnS, In<sub>2</sub>S<sub>3</sub>, In(OH)xSy, CuInS<sub>2</sub> and related compounds, CdTe).

*Characterisation techniques* at TUT: XRD, SEM+EDX+WDX; micro-Raman, AFM, UV-VIS, FTIR, TG/DTG/DTA, TG/EGA(FTIR), PL (8K+ temperature dependent), I-V, impedance spectroscopy (RT+temperature dependent), solar cells output characteristics. Experience also in XPS (PES), ellipsometry, Kelvin probe, surface photovoltage, NMR measurements (at partners).

**Field of competencies**

- Thin films formation chemistry in spray pyrolysis, chemical bath and sol gel deposition processes including reactions in solutions, structure and thermal decomposition of intermediate complexes formed in wet chemical processes;
- Deposition of flat and nano-micro structured device quality thin films and multilayered structures;
- Elemental and phase composition, crystal quality of thin films;
- Structural, optical and electrical properties of thin films of semiconductors and dielectrics;
- Defect structure of materials;
- Properties of photovoltaic structures.

**Abstract:** The research is directed to development of nanocrystalline/nanostructured inorganic thin films by wet chemical methods of chemical spray pyrolysis, chemical bath, SILAR and sol-gel deposition techniques. These methods are simple, fast and industrially relevant to produce large area films at low cost. The objective of the research work was to develop device quality films for several applications in electronics and optoelectronics. Main attention is paid to the photovoltaic materials - window layers of ZnO, TiO<sub>2</sub> and buffer/absorber layers such as CdS, ZnS, In<sub>2</sub>S<sub>3</sub>, In(OH)xSy, CuInS<sub>2</sub>, CuInSe<sub>2</sub>, CdTe, etc. The approach applied comprises the chain of studies from the precursors to thin films and devices. Fundamental studies are focused to the films formation chemistry including the chemical reactions in solution, formation of intermediate phases, its thermal decomposition and thin film growth mechanisms, and the materials defect structure. Applied research is going in the field of preparation and characterisation of the films and multilayered structures, including solar cells.

**Contact:** Department of Materials Science, Tallinn University of Technology. Email: [malle@staff.ttu.ee](mailto:malle@staff.ttu.ee); <http://www.ttu.ee/>  
Ehitajate tee 5, Tallinn 19086, Estonia  
Phone: +372 620 336; Fax: +372 620 3367



I Oja



A. Mere



O. Kijatkina



T Dedova



Dr. J Hiie



Prof. E. Mellikov