

# POLISH ACADEMY OF SCIENCES

## Aleksander Krupkowski Institute of Metallurgy and Materials Science in Cracow



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The Institute was established in 1952 on the initiative of Professor Aleksander Krupkowski the father of the Polish metallurgy of non-ferrous metals. It has conducted for many years numerous basic research on the design and production of metallic and non-metallic materials of desired mechanical, physical and chemical properties. In recognition to its scientific achievements, the Ministry of Science and Higher Education, the main Polish scientific authority, awards the Institute the highest possible grade in every-four-year assessments. Considerable scientific achievements, modern research equipment and long-standing experience in carrying out scientific research enabled the establishment of the Accredited Testing Laboratories with a flexible accreditation range of the Polish Center for Accreditation. The Institute has performed a few dozen of research projects granted by the Ministry of Science and Higher Education, National Science Centre and National Centre for Research and Development and Cohesion Funds from EC.

### RESEARCH PRIORITIES

#### User-friendly materials and technologies

- lead-free solders,
- multicrystalline silicon solar cells,
- new biocompatible materials for the artificial heart and blood containing materials.

#### Amorphous, nano- and microcrystalline materials

- amorphous and nanocrystalline aluminum alloys,
- electrolytic protective coatings with improved tribological and anticorrosive properties,
- severe plastic deformation and fabrication of ultra-fine grain materials,
- metallic materials for dental implants.

#### Knowledge-based multifunctional materials

- multilayered materials,
- metallic materials for hydrogen storage,
- metallic materials with shape memory and magnetocaloric effect,
- thermophysical and thermomechanical properties of functional materials.

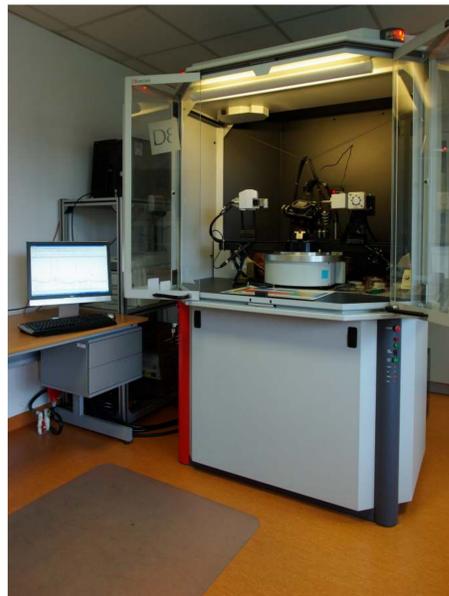
#### Development of modern research tools and diagnostics methods

- crystallographic orientation mapping basing on the X-ray, scanning and transmission electron microscopy examinations of local grain orientations,
- identification of residual stresses in near-surface areas of gradient and layered-structured materials
- data processing of local crystallographic orientations
- complex characteristics of advanced materials using new techniques of X-ray and TM microscopy.



**Testing machines:** Instron model 3382, Instron Model 6025/Zwick, MTS/Adamel Dy30, Zwick ZHU 250 (hardness & microhardness tester) Testing of mechanical properties (tensile and compression) at 100kN load.

### RESEARCH APPARATUS



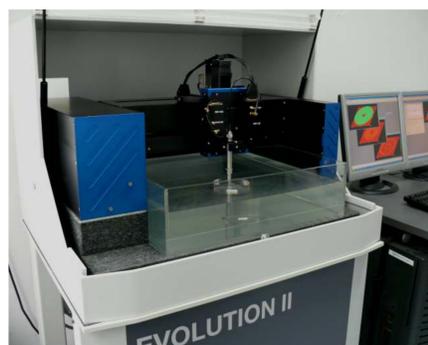
**X-Ray Diffraction** (Bruker D-8 Discover and Philips X'Pert PW 1710 + PW 1830 and Rigaku MSF-3M).



**Transmission Electron Microscopy** (Philips CM-20 200kV Twin with EDS system from EDAX, Tecnai G2F20 200kV with FEG and EDS system from EDAX and FIB Quanta 3D for thin foil preparation)



**Jobin Yvont Glow Discharge Spectrometer JY 10 000RF**  
Surface and depth profile chemical analysis



**Scanning Acoustic Microscope SAM TEC Evolution Series**  
nondestructive and fast examinations of volume and layer thickness materials



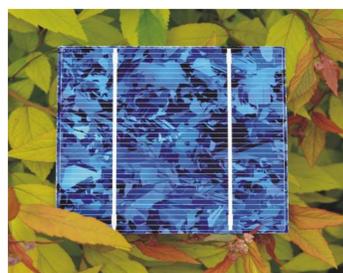
**Scanning Electron Microscopy**  
Philips XL 30 with EDS Link ISIS system from Oxford Instr. FEI E-SEM EX30 with EDS system from EDAX GENESIS 4000, FEI FEGSEM 3D with EDAX GENESIS 4000 with Apollo 40 detector and ionic column for 3D analysis.



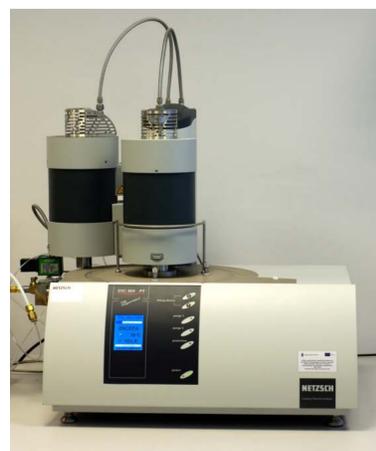
**Confocal Laser Scanning Microscopy**  
Fluorescent 3D analysis of the biological structures and substructures and fluorescently labeled synthetic materials. Topography analysis of the surfaces.



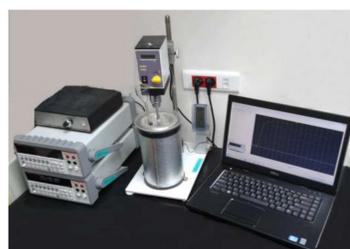
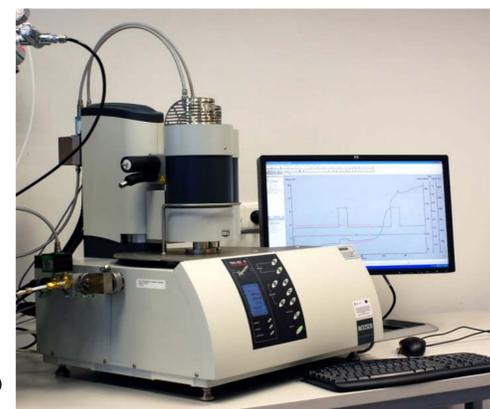
**High Temperature Calorimeter 96 Line**  
(DTA 96-1750°C, MHTC 96 drop-1500°C)



**Solar cell** Produced in the Photovoltaic Laboratory of IMIM PAS in Kozy near Bielsko-Biala.



**Thermal Analysis Instruments:**  
404 F1 Pegasus NETZSCH, DuPont 910 (DSC) and DuPont 1600, DT Q600 TA Instruments



**Room temperature calorimeter**  
(formation enthalpy of intermetallic compounds on the base of alkali metals)



**High Temperature Dilatometer**  
Misura® 3 FLEX-ODLT



**Instruments: PR-30/600 and PR-37/1600**  
(contact angle measurement by optical method)