ARISTOTLE UNIVERSITY OF THESSALONIKI

RESEARCH COMMITTEE

# X-RAYS, OPTICAL CHARACTERIZATION & THERMAL ANALYSIS LABORATORY (XOPTH - AUTH)

The scope of X-Rays, Optical Characterization and Thermal Analysis Laboratory (XOpTh-AUTh), located in the Department of Physics AUTh, is the development and research of high-tech activities, the collaboration with research centers and academic institutions, and the organization of lectures and other scientific events. The research objectives of XOPTh-AUTh are:

1. Formation and synthesis of high-tech materials.
2. Structural and chemical state characterization using X-ray methods.
3. Optical Properties and Spectroscopy.
4. Thermal analysis.
5. Morphological characterization and elemental analysis of materials and surfaces.

**Application Field**

- Coatings and thin film technology
- Thermoelectric Materials
- Polymer Nanocomposites (thermally conductive polymer nanocomposites, pipes for geothermal applications, thermosetting adhesive from renewable new materials)
- Biomaterials/Bioceramics
- Works of Art/Cultural Heritage
- Minerals/Gemstones

**Services Offered to Third Parties**

- X-Ray Diffraction Analysis (XRD)
- X-Ray Photoelectron Spectroscopy (XPS/AES)
- Thermogravimetric and Differential Thermal Analysis (TG-DTA)
- Differential Scanning Calorimetry (DSC)
- Fourier Transform Infrared Spectroscopy (FTIR/micro-FTIR)
- Scanning Electron Microscopy (SEM-EDS)
- UV-Vis Spectrophotometry

## X Rays, Optical Characterization & Thermal Analysis Laboratory (XOpTh - AUTh)

**Head of the Laboratory** Konstantinos Chrissafis

**Members of the Lab/Research Team** George Vourlias, Eleni Pavlidou, Panagiotis Patsalas, Triantafyllia Zorba, Dimitrios Karfaridis, Lamprini Malletzidou

**Contact** **T** +30 2310 998066 **E** gvourlia@auth.gr **W** http://xopth.physics.auth.gr/

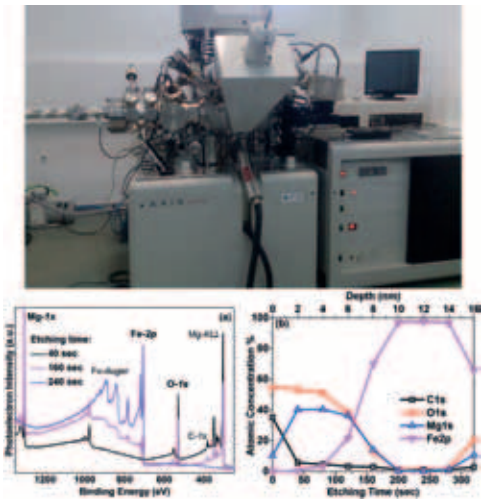

**Figure 1**
Kratos AXIS UltraDLD (Shimadzu group company) X-Ray Photoelectron (XPS) and Scanning Auger Microscopy and Spectroscopy System (SAM/AES). XPS measurements on Fe(12nm)/MgO(10nm) thin bilayers performing Ar+ etching process.
(a) Representative wide-scan (full range) spectra.
(b) Depth profiling of elementary atomic concentration.

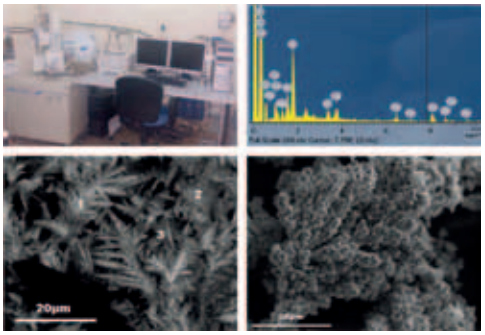

**Figure 4**
Surface imaging, morphology and structural examination is performed by Scanning Electron Microscopy (SEM) using JEOL JMS-390LV, coupled with Energy dispersive X-Ray microanalysis (EDX). The method provides elemental analysis and topography of the specimens under examination.

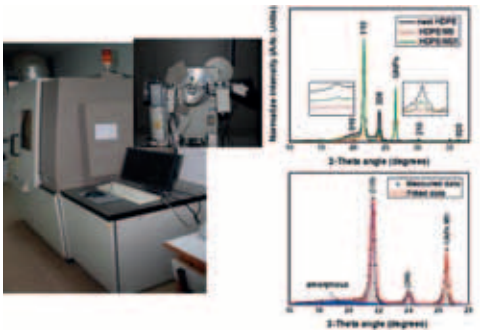

**Figure 2**
X-Ray diffraction (XRD) patterns are recorded by a water-cooled 2 cycles Rigaku Ultima diffractometer using CuKa radiation operating at Bragg-Brentano and Grazing Incidence (GIXRD) geometry.

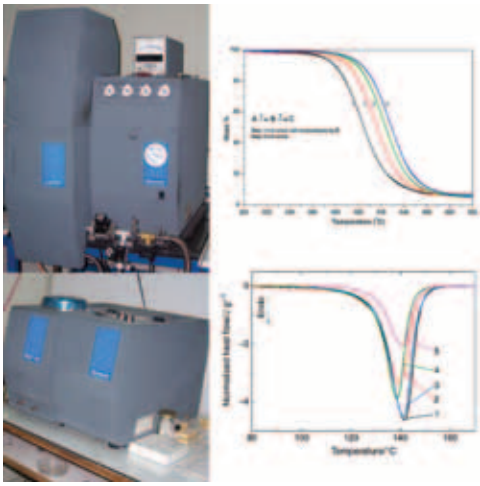

**Figure 5**
Thermogravimetric and Differential Thermal Analyses (TG-DTA) are conducted by SETARAM SETSYS 16/18. Identification of phase transformations by temperature fluctuations and prediction of oxidation resistance. Differential Scanning Calorimetry (DSC) is performed by SETARAM 141 for the determination of the energy limits of materials in physicochemical processes.

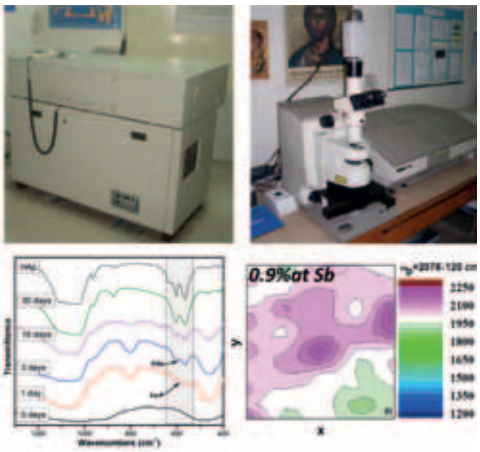


**Figure 3**
Fourier Transform Infrared (FTIR) spectrometer Bruker IFS 113v (spectral range 20.000 - 20cm-1 with vacuum operation) and FTIR microscope PerkinElmer i-series, connected with Spectrum 1000 spectroscope. Data collection in Transmittance and Reflectance mode. For the molecular investigation of materials, including characterization, progress in synthesis and ageing studies.

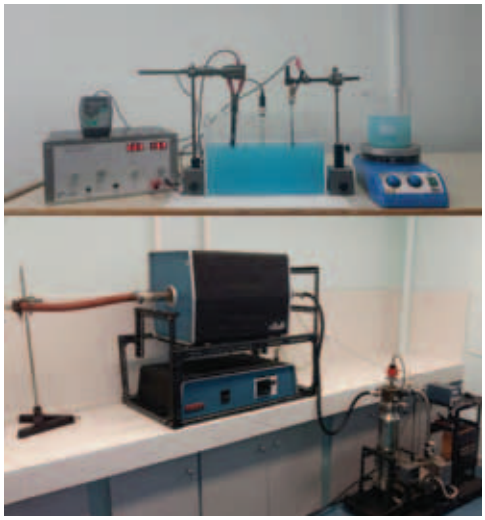

**Figure 6**
Material synthesis and growth using conditions of industrial production line, as Hot dip galvanizing, CVD methods, Electrodeposition and Melt-mixing. Application Fields regarding Synthesis and Characterization of Coatings and thin film technology, Thermoelectric Materials, Biomaterials-Bioceramics, etc.