



## ANALYSER ET OBSERVER LA MATIÈRE

### OBSERVATION AND ANALYSIS OF MATERIALS

Lecturers: Fabrice DASSENOY, Magali PHANER GOUTORBE

| Lecturers : 24 | TC : 4 | PW : 4 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : AN

#### Objectives

The important progresses made in the field of "materials science" are strongly linked to the development of methods making possible the characterization of solid materials down to the microscale. Most of the analysis techniques are based on the interaction between probes (photon, electron, ion) and the matter.

We will alternate a basic teaching on the physical concepts on which the main characterisation techniques of materials are based and a description of the principle and applications of the most commonly used techniques (XPS photoelectron spectroscopy, X-Ray Diffraction, electron and near field microscopy (STM, AFM)).

The final objective is to give to the future engineer the keys to be able to choose the most appropriated

**Keywords :** Radiation / matter interaction, characterisation techniques of materials, XPS, RBS, XRD, IR, Electron microscopy

#### Programme

- Introduction: Classification of the different interaction processes
- Photon-matter interaction
- Energy levels and IR spectroscopy
- X-ray diffraction technique
- XPS and IR techniques
- Ion / matter interaction
- RBS and SIMS techniques
- Electron / matter interaction
- Electron microscopy techniques (TEM / SEM)

#### Learning outcomes

- To know the principles of materials characterization techniques.
- To know the information provided by these different characterisation techniques
- To Know how to choose a characterisation technique according to the industrial problem

#### Independent study

**Objectifs :** The objective of this autonomous work is to identify, from the results (spectra, diffractograms, images) obtained from various characterization techniques, the nature of the material at the origin of these structural, morphological and chemical information.

**Méthodes :** In groups of 5 or 6, students will have 2 hours (independent work) to interpret the spectra / diffractograms / images obtained from an unknown material. They will then have to present their results during a 15-minute oral presentation and make a proposal for the material at the origin of these

#### Core texts

M. Ammou, *MICROCARACTÉRISATION DES SOLIDES*, CRAM CNRS, 1989  
D. Brune *SURFACE CHARACTERIZATION*, Wiley-VCH, 1997  
R.W. Cahn *MATERIALS SCIENCE AND TECHNOLOGY*, VCH Weinheim, 1994

#### Assessment

2-hour test covering lessons and tutorials (with documents) + mark on the restitution of the autonomous work