UCL Université catholique de Louvain

LMAPR2642

2012-2013

Characterisation of Inorganic Materials

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Jacques Pascal ; Proost Joris ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Main themes :	Study of the methods of characterisation of the microstructure of crystalline materials (metals and ceramics) and, in particular, of the methods based on (scanning and transmission) electron microscopy and diffraction of x rays and electrons. The objective is to show the specificity and complementarity of these methods for the description and quantification of the microstructure of crystalline materials. Overview of electro-analytical techniques, applied to the study of the chemical nature and electrochemical mechanisms of some technologically relevant electrochemical reactions.
Aims :	A first objective of the course is to render the student capable of characterising the microstructure of a material by using in a combined way the techniques of visible light and electron microscopy, the methods based on the diffraction of x rays, electrons, or neutrons, and the electron probe microanalysis. This competence should also enable the student to understand and analyse in a critical way the results concerning these techniques (micrographs, spectroscopic charts, diffraction patterns) presented in the scientific and technical literature. The second objective is to give students an overview of relevant electro-analytical techniques through practical lab sessions implying at the electrochemical characterisation of fuel cells. A final objective is to provide students with practical guidelines to quantify the statistical relevance of results obtained from materials characterisation methods. *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Content :	Quantitative microscopy - image treatment and analysis Physical and electronic optics Scanning electron microscopy Electron probe microanalysis Reminder of the bases of crystallography and diffraction by crystals Transmission electron microscopy Study of crystalline defects Analytical electron microscopy Crystalline texture and measurement of textures Electron backscattering diffraction - crystal orientation microscopy Electrochemical characterisation methods : voltammetry, basic potential step methods, potential sweep methods. Fuel cell characterisation (including practical lab sessions on prototype fuel cells) Practical engineering statistics : hypothesis testing (incl. exercises)
Other infos :	The course combines lectures with practical work in laboratory, as well as mini-projects. the emphasis is on the practical use of the characterisation equipments. For the electrochemical part, a good introductary guide for non-specialists is "Electrode Dynamics", by A.C. Fisher (Oxford Chemistry Primers).
Cycle and year of study :	> Master [120] in Physical Engineering > Master [120] in Chemical and Materials Engineering
Faculty or entity in charge:	FYKI