

**Course title:** Experimental methods in catalysis and surface characterization / selectable

**Number of contact hours:** 15 hours (15h lectures/seminar)

**ETCS credits:** 1

**Course description:** The course reviews the experimental methods used in catalysis and chemical technology: spectroscopic (e.g. IR, Raman, UV-Vis, MS, EPR, XPS, EXAFS), diffraction (e.g. XRD, SAXS), microscopic (e.g. STM, SEM/TEM, PEEM). Additionally, some modern approaches will be shown: in situ and operando methods, synchrotron and free electron laser methods. The characterization of materials will be discussed: elementary composition, phases and crystallinity, phase changes during reaction, surface and bulk composition, porosity, dispersion of active phases, acidic/basic site strength, activity testing. Types of catalytic processes and surface modifications will be presented.

**Education effects** (P6S\_UW, P7S\_WG):

- **knowledge:** student is able to choose methods necessary for certain processes in catalysis; able to explain the different types of methods used in surface characterization; have a basic knowledge about catalysis and surface processes
- **skills:** student is able to describe and explain: - the basic methods used in catalysis and surface characterization; - basic surface topology and processes; - basic problems in experimental methods
- **social:** student has a knowledge about the modern material characterization methods

**Literature:** [1] J.W. Niemanstverdriet, Spectroscopy in Catalysis, New York, 1995, Wiley-CH; [2] D. Brune, R. Hellborg, H. J. Whitlow, O. Hunderi, Surface Characterization: A User's Sourcebook, New York, 1997 WILEY-VCH Verlag GmbH;

**Assessment method:** Final test, seminar presentation

**Prerequisites:** Basic knowledge in physical chemistry

**Primary target group:** All specialties students

**Lecturer:** dr hab. inż. I. Czekaj, Contact person: dr hab. inż. I. Czekaj e-mail: [iczekaj@chemia.pk.edu.pl](mailto:iczekaj@chemia.pk.edu.pl)