

Name: Adsorbents and catalysts (C-PS.II1-AdsCat)

Name in Polish:

Name in English: Adsorbents and catalysts

Information on course:

Course offered by department: Faculty of Chemistry

Course for department: Faculty of Chemistry

Default type of course examination report:

Examination

Language:

English

Description:

Both lecture and laboratory

Definition of the adsorption, the thermodynamical description, free energy at the interfaces (Gibbs equation). Adsorption isotherms for the gas-phase; determination and the Langmuir model. Theory and BET equation. The potential of the adsorption. Adsorption from solutions. Kinds of adsorbents and their physicochemical characterization (with the regard of spectroscopic methods).

The catalysis and catalysts. Models of the reacting molecules. The energy-part of the third body in chemical reactions. The formal kinetics of heterogeneous catalytic reactions – mono- and bimolecular reactions. Mechanisms of the catalytic bimolecular reactions. Stages limiting rate of the catalytic reactions. Experimental kinetic equations of the catalytic reactions. Active centers on the catalysts' surface and catalytic activity. Geometrical, energetic and electronic aspects of the heterogeneous catalysis phenomena. The classification of heterogeneous catalysts and the characterization of main catalysts groups. Preparation of heterogeneous catalysts - basic stages, methods of preparation, unit and process operations for catalysts precursors transformation into the final form (drying, calcination, reduction). The modern approach for catalysts design.

Bibliography:

1. M. Bowker, The basis and application of heterogeneous catalysis, Oxford Univ. Press, 1998.
2. J.M. Thomas, W.J. Thomas, Principles and practice of heterogeneous catalysis, VCH Weinheim, 1996.
3. G.C. Bond, Heterogeneous catalysis (2nd edition), Oxford Univ. Press, 1987.
4. J.M. Campbell, Catalysis at Surfaces, Chapman and Hall, London 1988.
5. Lecture notes.

Learning outcomes:

KNOWLEDGE

W1. Has knowledge to describe a role of catalysis in chemical technology.

K_W01

W2. Has knowledge to describe and analyze the correlation between catalysis and the process conducted. K_W01.

W3. Has knowledge to characterize the chosen adsorbents and catalysts.

K_W01

SKILLS

U1. Can identify and analyze improvements in technologies with adsorbents and catalysts participation. K_U01

ATTITUDES

K1. Understand creativity and ability of interdisciplinary thinking and catalysis role in sustainable development. K_K06

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Contact hours (work with an academic teacher)
Lecture 30 hrs
Laboratory 30 hrs
Total number of hours with an academic teacher
60 hrs
Number of ECTS points with an academic teacher
2
Non-contact hours (students' own work)
Literature studies 10 hrs
Preparation and participation in reports 30 hrs
Preparation and participation in exam 20 hrs
Total number of non-contact hours
60 hrs
Number of ECTS points of non-contact hours
2
Total number of ECTS points for the module
4

Consultation 2 hrs

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Credits and final (written) exam: W1-W3, U1, K-1

Requirements

Fundamentals of physical chemistry, chemical technology and base knowledge of spectroscopic methods.

Course credits in various terms:**<without a specific program>**

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	4	15/16	