

Course description

Course abbreviation:	KCH/TEXPL	Page:	1 / 3
Course name:	Texture of Solid Substances		
Academic Year:	2016/2017	Printed:	25.09.2017 22:43

Department/Unit /	KCH / TEXPL	Academic Year	2016/2017
Title	Texture of Solid Substances	Type of completion	Exam
Accredited/Credits	Yes, 6 Cred.	Type of completion	Oral
Number of hours	Přednáška 2 [Hours/Week] Cvičení 1 [Hours/Week]		
Occ/max	Status A Status B Status C	Course credit prior to	NO
Summer semester	11 / - 0 / - 0 / 0	Counted into average	YES
Winter semester	0 / 0 0 / 0 0 / 0	Min. (B+C) students	not determined
Timetable	Yes	Repeated registration	NO
Language of instruction	Czech	Semester taught	Summer semester
Substituted course	None		
Preclusive courses	N/A		
Prerequisite	N/A		
Informally recommended courses	N/A		
Courses depending on this Course	N/A		

Course objectives:

Aims

In the subject, the student will be familiarized with the texture properties of solids (morphology, outer, internal surface, volume and distribution of pores) and methods of their evaluation and quantification.

The adsorption methods of study of the solids surfaces under the static and dynamic conditions will be explained.

Theories of the monomolecular and multilayer adsorption and theory of the volume filling of micropores will be stated in detail.

Attention will be paid to method of the high pressure mercury porosimetry, method of the X-ray dispersion under the small angles, method of the inversive gas and liquid chromatography as well as evaluation of the substances texture from the point of the fractal geometry. Connection between the texture parameters and the utility properties of solids will be shown.

Requirements on student

Requirements

Satisfying the exam requirements to obtain at least grading "good"

Evaluation of the subject as well as the exam grading is made according to the articles No 31 - 33 in the Regulations on Study and Examinations University of Ostrava

Content

Content

1. The texture properties of solids - significance for the industrial application as well as for the solids behaviour in nature. The basic texture parameters (external, internal surface area, apparent (mercury) and real (helium) density of solids, total volume of pores, distribution of pores), characterization and classification of pores according to their sizes.
2. Theory of adsorption on solids - the basic concepts (adsorbent - adsorbate - adsorptivity), characterization of the adsorption sites - homogeneous, heterogeneous surfaces, interaction adsorbate - adsorbent, quantification of the adsorption forces (Lennard-Jones potential), adsorption isotherms, Brunnauer's classification of the adsorption isotherms.
- 3+4. The experimental procedures of the texture parameters determination: adsorption methods - dynamic, static (gravimetric, volumetric), methods of the inverse gas and liquid chromatography, adsorption from the liquid medium, calorimetric methods, pycnometric methods, method of the high pressure mercury porosimetry (Washburn equation, derivation), the X-ray dispersion under the small angles.
5. Types of the adsorption isotherms, theory of monomolecular adsorption, Langmuir isotherm - description, derivation, linearization, the internal surface area determination, and the practical examples.
6. They of multilayer adsorption (BET), derivation, linearization, the internal surface area calculation, B point.

7. Adsorption in the micropores - theory of the volume filling of micropores, Polanyi potential, Dubinin - Polanyi (Dubinin-Raduškevič) isotherm, Dubinin postulates, recalculation of DP isotherm for other temperatures and adsorbates, Medek calculation of the surface area of micropores.
8. Adsorption in the mesopores, capillary condensation, Kelvin equation, calculation of the pores distribution according to their sizes.
9. Adsorption in the flow arrangement, Glueckauf method of the adsorption isotherm determination.
10. Adsorption from the gases mixture - the quantification procedures; sorption from the liquid (aqueous) media, the experimental data evaluation, characterization of the adsorption sites for sorption of metals, organic pollutants.
11. Evaluation of the compounds texture from the point of fractal geometry, significance and possibility of determination of the fractal dimension D.
12. The gases and liquids flow through the porous medium (viscous flow, Knudsen diffusion), specific permeability, connection between the permeable characteristics and the texture parameters of solids, the experimental procedures.
13. The time reserve

Prerequisites - other information about course preconditions

none

Competences acquired

Competences

The students acquire and deepen their knowledge of the basic methods and the experimental approaches to understanding of structure and texture of solids. The students understand the experimental methods including their theoretical bases used for understanding of structure and texture of solids and they can correctly and realistically interpret records of the experimental tests.

Studijní opory

Guarantors and lecturers

- **Guarantors:** prof. Ing. Boleslav Taraba, CSc.
- **Lecturer:** prof. Ing. Boleslav Taraba, CSc.
- **Tutorial lecturer:** prof. Ing. Boleslav Taraba, CSc.

Literature

- **Basic:** Ponec, V., Knor, Z., Černý, S.: *Adsorpce na tuhých látkách, Praha SNTL, 1968.*

Time requirements

Activities	Time requirements for activity [h]
Being present in classes	39
Self-tutoring	40
Preparation for an exam	50
Consultation of work with the teacher/tutor (incl. electronic)	21
Total:	150

assessment methods

professional knowledge

- Continuous analysis of student's achievements
- Dialogue
- Oral examination
- Written examination

prerequisite

professional knowledge

none

teaching methods**professional knowledge**

Dialogic (discussion, dialogue, brainstorming)

Monologic (explanation, lecture, briefing)

Working with text (coursebook, book)

learning outcomes**professional knowledge**

Competences

The students acquire and deepen their knowledge of the basic methods and the experimental approaches to understanding of structure and texture of solids. The students understand the experimental methods including their theoretical bases used for understanding of structure and texture of solids and they can correctly and realistically interpret records of the experimental tests.

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan	v.	Year	Block	Status	R.year	R.
Chemistry	Postgraduate Master	Full-time	Analytical Chemistry of Solid Phase	1	2013		2016	Povinné předměty	A	1	LS
Chemistry	Postgraduate Master	Full-time	Teaching for Secondary Schools - Single-Specialization Chemistry	1	2		2016	Povinně volitelné předměty	B	1	LS
Chemistry	Postgraduate Master	Full-time	Teaching for Secondary Schools - Single-Specialization Chemistry	1	2015		2016	Výběrové předměty	C		LS