

# Course description

<b>Course abbreviation:</b>	KCH/TEXPL	<b>Page:</b>	1 / 3
<b>Course name:</b>	Texture of Solid Substances		
<b>Academic Year:</b>	2016/2017	<b>Printed:</b>	20.01.2018 15:47

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

#### Fields of study

#### 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
<b>Total:</b>	<b>150</b>

#### assessment methods

##### professional knowledge

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

#### teaching methods

**professional knowledge**

Dialogic (discussion, dialogue, brainstorming)

Monologic (explanation, lecture, briefing)

Working with text (coursebook, book)

**learning outcomes****professional knowledge - knowledge resulting from the course:**

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