KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

UNIA EUROPEJSKA
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FUNDUSZ SPOŁECZNY

Course title	ECTS code
Crystal chemistry	13.3.0521

Name of unit administrating study

Faculty of Chemistry

Studies

faculty	field of study		
Wydział Chemii	Chemia	type	drugiego stopnia
		form	stacjonarne
		specialty	chemia biomedyczna, analityka i diagnostyka chemiczna, chemia i technologia środowiska, chemia obliczeniowa
		specialization	wszystkie

Teaching staff

dr hab. Artur Sikorski, profesor uczelni

Forms of classes, the realization and number of hours

Forms of classes

Auditorium classes, Lecture

The realization of activities

classroom instruction

Number of hours

Lecture: 15 hours, Auditorium classes: 30 hours

ECTS credits

4
classes 45 h
Tutorial classes 10 h
Studnet's own work 45 h
TOTAL: 100 h - 4 ECTS

The academic cycle

2022/2023 winter semester

Type of course

obligatory

Language of instruction

polish

Teaching methods

- discussion
- multimedia-based lecture
- problem solving

Form and method of assessment and basic criteria for eveluation or examination requirements

Final evaluation

- Graded credit
- Examination

Assessment methods

- written exam with open questions
- (mid-term / end-term) test
- graded course credit based on individual grades obtained during the semester

The basic criteria for evaluation

• lecture: students who have received positive grades from both tests can take the exam; the exam consists of 5 open questions, covering material discussed in the lecture and exercises detailed in the teaching content; final grade according to the scale of grades given in the Study Regulations; additional written exam for students who did not obtain the required 51% in the first term
• exercises: two tests, each covering a range of material from 7 exercises; test consists of 5 open questions, of which one is theoretical issues covering material discussed in the classes specified in the teaching content;. final grade according to the scale of grades given in the Study Regulations; additional written exam for students who did not obtain the required 51% in the first term

Method of verifying required learning outcomes

Required courses and introductory requirements

A. Formal requirements
completed course in "General chemistry"

B. Prerequisites

none

Aims of education

The familiarizing of students with the: structure of crystals; basic crystallographic laws and equations describing them; classification of crystalline materials based on various criteria; and with the method of determining the structure of monocrystalline materials using of single crystal X-ray diffraction method.

Course contents

A. Lecture

The role of crystallography in modern chemistry. Definition of the crystalline material. Crystal unit cell. Crystallographic systems. Crystal lattice and space lattice. Space groups. Classification of crystalline materials based on symmetry. Basic elements of symmetry and symmetry operations. Symmetry in crystal morphology. Symmetry classes and their symbolism. Symmetry in the structure of the crystals. Types of Bravais lattices. Translational symmetry. Space groups and their symbolism. Classification of crystalline materials based on chemical composition and stoichiometric ratios. Packing of atoms, ions and molecules in the crystal lattice - hexagonal arrangement of balls, coordination, interstices. Structures of selected elements and chemical compounds. Fundamentals of single-crystal X-ray diffraction method. Sources and characteristics of X-rays. X-ray diffraction on a crystal lattice. Solving and refining the crystal structure. Structural Databases. Quasicrystals.

B. Exercises

Characteristics of crystallographic systems. Crystal lattice and space lattice. Construction of the space lattice - coordinates of the location of lattice nodes, equations and indicators of lattice row and lattice planes. Basic crystallographic definitions: unit cell volume, interatomic and interplanar distances, interplanar angles, theoretical crystal density. Different forms of description of symmetry elements. Types of Bravais lattices. Geometry of coordination figures / polyhedrons. Packing of atoms in the crystal lattice - hexagonal arrangement of balls, degree of filling the crystal space, tetragonal and octahedral interstices. Types of chemical bonds. Atomic, ionic and van der Waals radiuses. Classification of crystalline materials based on chemical composition and stoichiometric ratios (according to Strukturbericht). Classification of structures according to Pearson's symbolism. Isomorphism and polymorphism. Structures of selected elements and chemical compounds.

Bibliography of literature

Literature required to pass the course :

1. Bojarski Z., Gigla M., Stróż K., Surowiec M., Krystalografia, PWN, 2008.
2. Trzaska Durski Z., Trzaska Durska H., Podstawy krystalografii strukturalnej i rentgenografii, Oficyna Wydawnicza. Politechniki Warszawskiej, 2003.

Extracurricular readings

1. Penkala, T., Zarys Krystalografii, PWN, 1983.
2. Luger, P., Rentgenografia strukturalna monokryształów, PWN, 1989.
3. Wells, A. F., Strukturalna chemia nieorganiczna, WNT, 1993.

The learning outcomes (for the field of study and specialization)

Knowledge

Student: defines a crystal; draws different types of elementary cells; characterizes different crystallographic systems; distinguishes the crystal lattice from the space lattice; characterizes individual elements of the spatial lattice (nodes, rows, planes); describes the elements of point and translational symmetry; explains what packing depends on of atoms, ions and molecules in the crystal lattice; explains the different criteria of division of crystals; characterizes the structures of selected elements and chemical compounds; explains how to determine the structure of chemical compounds using single-crystal X-ray diffraction method

Skills

Student:

- organizes workshop.
- solves scientific problems, critically refers to the results obtained,
- proposes alternative methods of solving scientific problems,
- analyzes the results obtained based on their knowledge,
- draws conclusions based on experimental data,
- verifies the results based on literature data

Social competence

Student:

- strives to acquire knowledge,
- works independently, and in a team performing different roles in it,
- shows creativity during the presentation of results,
- engages in solving scientific problems,
- cares for the acquisition of knowledge by others,

	• discusses scientific problems (theses)

Contact

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