University of Gdańsk

Subject card

Subject name and code	Crystal chemistry, PG_00054406		
Field of study	Chemistry		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	postgraduate studies	Subject group	Obligatory subject group in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	academic	Assessment form	
Conducting unit	Pracownia Krystalochemii -> Katedra Chemii Fizycznej -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Artur Sikorski	
	Teachers	dr hab. Artur Sikorski	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	15	2.0	33.0	50

Subject objectives	The aim of the course is to familiarize students with the structure of crystals, the basic crystallographic laws and equations describing them, the classification of crystalline substances based on various criteria and with the methods of determining the crystal structure of compounds by X-ray structural analysis.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.	Student: defines a crystal; knowns different types of elementary units; 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.	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.	The student knows the building and principle of operation of an X-ray diffractometer	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W03] Demonstrates extended knowledge in the field of modern measuring techniques used in chemical analysis.	The student knows the basic aspects of the construction and operation of measuring equipment; has the knowledge necessary to quantitatively describe chemical phenomena and processes	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W01] Uses knowledge of spectroscopic methods of chemical compound analysis.	The student knows and understands the theoretical basis of various spectroscopic methods; knows their advantages and disadvantages; is able to use X-ray diffraction methods on crystals/ powders to determine the structures of compounds	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W04] Applies the acquired knowledge to an in-depth description of the properties of chemical connections, methods of their synthesis and analysis.	The student is able to distinguish different types of crystals depending on the chemical bonds that occur in them; knows how to crystallize compounds using various techniques and knows methods of determination of their physicochemical properties	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	Student(ka) rozumie potrzebę i zna możliwości ciągłego dokształcania się i podnoszenia swoich kompetencji zawodowych, osobistych i społecznych; zachowuje krytycyzm w korzystaniu z internetu; przestrzega zasad etyki i praw autorskich	[SK1] oral statement/conversation/ discussion [SK5] implementation of a problem task [SK8] observation of student's independent or team work

Subject contents

The role of crystallography in modern chemistry. Definition of the crystal. 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. Classes of symmetry 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.

Prerequisites and co-requisites

General chemistry course

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written exam with open questions (tasks)	50.1%	100.0%

Recommended reading	Basic literature	A.1. used during classes 1. Bojarski Z., Gigla M., Stróż K., Surowiec M., Crystallography, PWN, 2008. 2. Trzaska Durski Z., Trzaska Durska H., Basics of crystallography structural and X-ray, Publishing House. Polytechnics Warszawska, 2003. A.2. studied independently by the student 1. Bojarski Z., Gigla M., Stróż K., Surowiec M., Crystallography, PWN, 2008.
	Supplementary literature	1. Penkala, T., Zarys Krystalografii, PWN, 1983. 2. Luger, P., Rentgenografia strukturalna monokryształów, PWN, 1989. 3. Wells, A. F., Strukturalna chemia nieorganiczna, WNT, 1993.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

Document generated electronically. Does not require a seal or signature.