University of Gdańsk

Subject card

Subject name and code	Crystal chemistry, PG_00054407						
Field of study	Chemistry						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
Education level	Master's studies		Subject group	Obligatory subject group in the field of study Subject group related to scientific research 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	credit			
Conducting unit	Laboratory of Crystallochemistry -> Department of Physical Chemistry -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Artur Sikorski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	30.0	0.0	0.0	0.0	30
	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	30		5.0	15.0	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_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 [SW3] text preparation/written work [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 [SW3] text preparation/written work [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 [SW2] presentation/project/paper/ report [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 [SW3] text preparation/written work [SW5] implementation of a problem task
[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 [SW3] text preparation/written work [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 [SK6] demonstration of practical skills [SK8] observation of student's independent or team work

Subject contents

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.

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	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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