University of Gdańsk

Subject card

Subject name and code	Fundamentals of crystallochemistry, PG_00170311						
Field of study	Chemical Business, Chemistry						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2025/2026			
Education level	Bachelor's studies		Subject group	Optional subject group			
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish polish			
Semester of study	4		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	30.0	0.0	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	Introducing students to the structure of crystals, fundamental crystallographic laws and the equations describing them, classification of crystalline solids based on various criteria, and methods for determining the spatial structure of compounds with crystalline structure using X-ray structural analysis.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BCHINŻ_U01] On the basis of the acquired knowledge, identifies, analyses and solves engineering tasks and problems in broadly understood chemistry.	Possesses organized and in-depth knowledge of crystallochemistry necessary for identifying, analyzing, and solving engineering tasks and technical problems. The student defines a crystal, knows different types of unit cells, characterizes various crystallographic systems, distinguishes between a crystal lattice and a spatial lattice, characterizes individual elements of the spatial lattice (nodes, lines, planes), lists and describes elements of point and translational symmetry, explains the factors determining the packing of atoms, ions, and molecules in the crystal lattice, explains various classification criteria, characterizes the structures of selected elements and chemical compounds, and explains how the spatial structure of chemical compounds is determined using the method of X-ray structural analysis of single crystals.	[SU1] oral statement/conversation/ discussion [SU5] implementation of a problem task
	[BCHINŻ_K05] Is convinced of the importance of behaving in a professional manner in every situation, taking full responsibility in the field of engineering activities and their impact on the natural environment and compliance with the principles of professional ethics.	Has a conviction about the importance of behaving professionally in every situation, taking full responsibility for engineering activities and their impact on the natural environment, and adhering to the principles of professional ethics.	[SK1] oral statement/conversation/ discussion [SK8] observation of student's independent or team work
	[BCHINŻ_W02] Enumerates basic laws and theories in chemistry, physics and mathematics necessary to formulate and solve simple engineering tasks.	Lists the laws and theories from crystallochemistry, physics, and mathematics necessary for formulating and solving simple engineering problems.	[SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
	[BCHINŻ_U09] Using the acquired knowledge, skills and various sources of scientific information independently prepares written papers and oral presentations.	Using acquired knowledge, skills, and diverse scientific information sources, independently prepares written papers and oral presentations in the field of crystallochemistry.	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task
	[BCHINŻ_W07] Describes the construction and operating principles of basic scientific, technological and control-measuring apparatus.	Describes the construction and operating principles of an X-ray diffractometer.	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
	[BCHINŻ_U02] Uses basic methods, techniques and tools in formulating and solving engineering tasks in the field of chemistry.	Applies methods, techniques, and tools in formulating and solving engineering tasks in the field of crystallochemistry.	[SU2] presentation/project/paper/ report [SU6] demonstration of practical skills
	[BCHINŻ_K03] Independently sets or implements a set action plan specifying priorities for its implementation; critically assesses its progress.	Independently establishes or carries out a set plan of action, determining priorities to achieve its implementation.	[SK1] oral statement/conversation/ discussion [SK2] presentation/project/paper/ report
	[BCHINŻ_U08] Uses the chemical nomenclature and engineering terminology properly.	Properly uses chemical nomenclature and engineering terminology.	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report
	[BCHINŻ_K01] Identifies the level of her/his own knowledge and skills as well as the need to update engineering knowledge, continuous professional training and personal development.	dentifies the level of own knowledge and skills as well as the need to update engineering knowledge in the field of crystallochemistry and to pursue continuous professional development and personal growth.	[SK1] oral statement/conversation/ discussion [SK5] implementation of a problem task [SK8] observation of student's independent or team work

	Course outcome	Subject outcome	Method of verification
	[BCHINŻ_K02] Works individually demonstrating initiative and independence in actions, and effectively cooperates in a team, performing various roles in it.	ndependently establishes or executes a set plan of action, determining priorities to achieve its implementation. Works individually, demonstrating initiative and autonomy in activities, and effectively cooperates within a team, fulfilling various roles.	[SK5] implementation of a problem task
Subject contents	The role of crystallography in modern chemistry. Definition of a crystal. Unit cell. Crystallographic systems. Crystal lattice. Spatial lattice. Classification of crystalline solids based on symmetry. Basic symmetry elements and operations. Symmetry in crystal morphology. Symmetry classes and their notation. Symmetry in the internal structure of crystals. Types of Bravais lattices. Translational symmetry. Space groups and their notation. Classification of crystalline solids based on chemical composition and stoichiometric ratios. Atomic packing in the crystal lattice: close packing, spatial arrangement of spheres, coordination number, voids. Structures of selected elements and chemical compounds. Basics of X-ray structural analysis of single crystals. Sources and characteristics of X-ray radiation. Diffraction of X-ray radiation on crystal lattices. Solving and refining crystal structures. 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-ended questions (tasks).	50.01%	100.0%
Recommended reading	Basic literature	A.1. Materials used during classes 1.Bojarski Z., Gigla M., Stróż K., Surowiec M., Crystallography, PWN, 2008. 2. Trzaska Durski Z., Trzaska Durska H., Fundamentals of Structural Crystallography and X-ray Diffraction, Publishing House of Warsaw University of Technology, 2003. A.2. Materials for independent study by the student 1. Bojarski Z., Gigla M., Stróż K., Surowiec M., Crystallography, PWN, 2008. 2. Chojnacki J., Introduction to Crystallography, PWN, 2025.	
	Supplementary literature	1. Penkala, T., Outline of Crystallography, PWN, 1983. 2. Luger, P., Structural X-ray Analysis of Single Crystals, PWN, 1989. 3. Wells, A. F., Structural Inorganic Chemistry, WNT, 1993.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Definitions of basic crystallochemical concepts: crystal, unit cell, crystallographic systems, crystal lattice, spatial lattice, classification of crystalline solids based on symmetry, types of Bravais lattices, classification of crystalline solids based on chemical composition and stoichiometric ratios, atomic packing in the crystal lattice (close packing), spatial arrangement of spheres, coordination number, voids, structures of selected elements and chemical compounds.		
Work placement	Not applicable		

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