



Subject card

Subject name and code	Glass and ceramic materials, PG_00048226						
Field of study	Chemistry						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle 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	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Inorganic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Anna Dołęga					
	Teachers	dr hab. Katarzyna Kazimierczuk prof. dr hab. inż. Anna Dołęga dr hab. inż. Ewa Wagner-Wysiecka					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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	Provide students with basic knowledge about the composition, structure, production and application of ceramics and glasses. Developing students' skills in solving simple problems related to the production and selection of ceramic materials.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U01] knows how to get information from literature, databases and other sources, can integrate the information obtained, interpret and critically evaluate it, and draw conclusions, and to formulate and justify the opinions	The student is able to independently obtain information on the manufacture and properties of glass and ceramic materials from literature			[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment		
	[K6_W05] knows and understands the chemical processes and algorithms of mathematical models which are necessary for the design of technological processes, knows chemical structure of contemporary materials and its relation to their properties, enabling the selection of the materials for sustainable development technology and material-efficient and energy-efficient methods	The student has knowledge of the processes of obtaining glass and ceramic materials and their selection according to a specific application.			[SW1] Assessment of factual knowledge		
	K6_W03	The student knows how the internal (molecular) structure of a material influences its properties.			[SW1] Assessment of factual knowledge		

Subject contents	<p>Lecture:</p> <ol style="list-style-type: none"> 1. Crystalline and amorphous solids; bonds in a solid: metallic, ionic, covalent bonds 2. Selected mechanical properties of materials 3. Glass and its types: calcium-sodium, borosilicate, quartz, tellurite, ITO, etc. 4. Obtaining and forming glass 5. Composites with glass: reinforced, laminated, bulletproof glass 6. Amorphous metals (metallic glasses) 7. Ceramic materials - general characteristics; quartz materials, silicic acids, silicates, aluminosilicates. Ordinary and noble ceramics. Refractory products. Ceramics in technology and industry. 8. Bioceramics - general characteristics, division of bioceramics: bioresorbable, neutral, bioactive porous materials. 9. Ceramic magnets 10. Oxide layers on a metallic substrate 11. Super-hard materials <p>Laboratory: Obtaining glasses by sol-gel method. Obtaining ceramic materials by sintering. Analysis of the obtained materials: FT-IR, AAS. A visit to the Lubiana porcelain factory.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Test</td> <td>50.0%</td> <td>67.0%</td> </tr> <tr> <td>Test and laboratory report</td> <td>50.0%</td> <td>33.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Test	50.0%	67.0%	Test and laboratory report	50.0%	33.0%
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Test	50.0%	67.0%										
Test and laboratory report	50.0%	33.0%										
Recommended reading	Basic literature	R. Pampuch, Współczesne materiały ceramiczne, Uczelniane Wyd. Naukowo-Dydaktyczne AGH, Kraków 2005										
	Supplementary literature	. R. Pampuch, K. Hajerko, M. Kordek, Nauka i procesach ceramicznych, Wyd. Naukowe PWN 1992										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. List the types of glass (due to the oxide composition) 2. Discuss the structure and properties of soda-lime and quartz glass 3. What raw materials are included in the glass set, how do these raw materials behave during heating? 4. What can glass be tinted with? 5. What are the ways of forming glass? 6. How is toughened glass made? 7. How are produced and what are the properties of composites: laminated glass, armored glass 8. Discuss the structural types of silicates 9. Discuss the structure of quartz. 10. Discuss the methods of obtaining fused quartz and fused silica and application of these materials 11. Present the sol-gel method of obtaining glassy silica - discuss the substrates, the mechanism of the reaction catalyzed by acids and bases 12. Discuss the preparation and reactivity of orthosilicic acid 13. How mesoporous silica is obtained 14. Discuss the physicochemical properties and reactivity of alumina 15. Present the reactions taking place in the Bayer process of obtaining alumina, 16. What is the sintering process? 17. What is Mullit and how is it obtained 18. What are refractory materials - name examples of refractory materials. 											
Work placement	Not applicable											

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