GDAŃSK UNIVERSITY OF TECHNOLOGY

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

Lecture:

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

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.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
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

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