University of Gdańsk

Subject card

Subject name and code	Laboratory of heterogeneous and homogeneous catalysis, PG_00121220						
Field of study	Chemical Business, Chemistry, Environmental Protection						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2027/2028			
Education level	Master'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	English			
Semester of study	3		ECTS credits	4.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Dagmara Jacewicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	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	65.0	100	
Subject objectives	The course aims to give an understanding of the relation between modern theories of catalysis and application for homogeneous and heterogeneous catalysts in oligomerization and polymerization process of olefins.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_U01] Plans and implements chemical experiments of medium complexity.	Student: - is active in planning an experiment regarding catalytic reactions both homogeneous and heterogeneous catalysis - is able to synthesize post-metallocene catalysts: the coordination complexes of chromium(III) and vanadium(IV) with organic and inorganic ligands - is able to draw conclusions from the conducted experiments, e.g. calculate catalytic activity - is able to classify a catalyst into the appropriate group of catalysts based on its activity - is able to carry out the experiments in accordance with the principle of environmental protection	[SU8] observation of student's independent or team work
[CHEMMU2_W01] Uses knowledge of spectroscopic methods of chemical compound analysis.	Student knows the spectroscopic methods of analysis of catalysts and obtained products, oligomerization and polymerization.	[SW4] test/exam - oral or written
[CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.	Using chemical knowledge in correlation with other natural sciences to explain the course of phenomena encountered in everyday life. The ability to use the acquired knowledge to assess threats and plan ways to counteract threats to human health and the natural environment.	[SU4] test/exam - oral or written
[CHEMMU2_W04] Applies the acquired knowledge to an in-depth description of the properties of chemical connections, methods of their synthesis and analysis.	Student: - knows homogeneous and heterogeneous catalysts - knows the mechanisms of the polymerization reaction as an exemplary catalysis reaction, including homogeneous and heterogeneous catalysts - understands the role of activators in catalyzed oligomerization and polymerization reactions	[SW3] text preparation/written work
[CHEMMU2_K06] Undertakes research tasks consciously and responsibly, understanding the social aspects of the practical application of the acquired knowledge and skills and the responsibility related to it.	Student: - is able to work in a safe way for all participants of the class group - engages in scientific discussions in group - takes responsibility for the work of the entire team - can play various roles in the group when solving research problems and performing experiments	[SK8] observation of student's independent or team work

Subject contents

The laboratory includes the catalyst synthesis (for example: the coordination complexes of chromium(III) and vanadium(IV) with organic and inorganic ligands), carrying out the processes of oligomerization and polymerization of olefin using the obtained catalysts, description of the processes involved in a catalytic cycle and interpretation of results from experimental investigations. The obtained materials will be characterized by UV-Vis spectroscopy, IR spectroscopy, Raman spectroscopy and others.

Prerequisites and co-requisites

Basic knowledge of general and inorganic chemistry. Completed course in general and inorganic chemistry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Performing the exercise	51.0%	15.0%
Test	51.0%	60.0%
Reports	51.0%	25.0%

Recommended reading	Basic literature	• L. Can, L. Yan, Bridging Heterogeneous and Homogeneous Catalysis: Concepts, Strategies, and Applications, WileyVCH Verlag GmbH & Co. KGaA, 2014. • Blom, R., Follestad, A., Rytter, E., Tilset, M., Ystenes, M. ,Organometallic Catalysts and Olefin Polymerization, Springer, 2001. • G. Odian, Principles of Polymerization, Wiley, 2004.
	Supplementary literature	• A. A. Shaikh, Heterogeneous Catalysis, Gruyter, Walter de GmbH, 2020. • P. W. N. M. van Leeuwen, Homogeneous Catalysis: Understanding the Art, Springer, 2004.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Describe the methods used for characterizing complex compounds. 2. Explain the process of polymerization. 3. Describe the classification of olefin polymerization catalysts.	
Work placement	Not applicable	

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