



KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez
Unię Europejską w ramach
Europejskiego Funduszu
Społecznego

UNIA EUROPEJSKA
EUROPEJSKI
FUNDUSZ SPOŁECZNY



Course title		ECTS code	
Laboratory of heterogeneous and homogeneous catalysis		13.3.1220	
Name of unit administrating study			
null			
Studies			
faculty	field of study	type	second tier studies (MA)
Faculty of Chemistry	Chemical Business	form	full-time
		specialty	all
		specialization	all
Faculty of Chemistry	Chemistry	type	second tier studies (MA)
		form	full-time
		specialty	all
Faculty of Chemistry	Environmental Protection	specialization	all
		type	second tier studies (MA)
		form	full-time
		specialty	all
		specialization	all
Teaching staff			
dr hab. Dagmara Jacewicz, profesor uczelni; dr Joanna Drzeżdżon			
Forms of classes, the realization and number of hours		ECTS credits	
Forms of classes		4 classes - 30 h tutorial classes - 30 h student's own work - 40 h TOTAL: 100 h - 4 ECTS	
Laboratory classes			
The realization of activities			
lectures in the classroom			
Number of hours			
Laboratory classes: 30 hours			
The academic cycle			
2022/2023 winter semester			
Type of course		Language of instruction	
an elective course		english	
Teaching methods		Form and method of assessment and basic criteria for evaluation or examination requirements	
Practical laboratory work - chemical experiments, analysis of obtained results and discussion.		Final evaluation	
		Graded credit	
		Assessment methods	
		short test and report from performed chemical experiments.	
		The basic criteria for evaluation	
		Laboratory classes: positive note from an short test with 5 open questions:	
		91-100% 5.0	
		81-90% 4.5	
		71-80% 4.0	
		61-70% 3.5	
		51-60% 3.0	
		< 51% 2.0	
		a. passing short test covering the material of the Laboratory classes	
		b. assessment criteria in accordance with the University of Gdańsk Study Regulations	
Method of verifying required learning outcomes			

Business Chemistry:

The method of verifying the acquisition of knowledge: Written short test concerning the main aspects of homogeneous and heterogeneous catalysis, compounds serving as catalysts for example in olefin polymerization and their physicochemical properties. During the laboratory experiments, the student solves problems in tests and oral discussions in the field of homogeneous and heterogeneous catalysis, kinds of catalysts and the types of reactions that require using of catalysts (K_BChII_W01, K_BChII_W06). The method of verifying the acquisition of skills: Assessment of the student's involvement in discussions on a research and experimental problems. Students analyse and solve tasks in the field of homogeneous and heterogeneous catalysts and also catalysis reactions and their conditions - working individually and/or in a team (K_BChII_U04, K_BChII_U08). Assessment of the effectiveness of work individually and in a group during the planning and execution of chemical experiments in the field of homogeneous and heterogeneous catalysis (K_BChII_K02).

Chemistry:

The method of verifying the acquisition of knowledge: Written short test concerning the main aspects of homogeneous and heterogeneous catalysis, compounds serving as catalysts for example in olefin polymerization and their physicochemical properties. During the laboratory experiments, the student solves problems in tests and oral discussions in the field of homogeneous and heterogeneous catalysis and spectroscopic methods of chemical compound analysis (K_W01, K_W04). The method of verifying the acquisition of skills: Assessment of the student's involvement in discussions on a research and experimental problems. Students analyse and solve problems and tasks in the field of homogeneous and heterogeneous catalysts and their conditions (K_U01, K_U04). Assessment of the effectiveness of work during the planning and execution of chemical experiments in the field of various types of catalysis (K_K06).

Environmental Protection:

The method of verifying the acquisition of knowledge: Written short test concerning the main aspects of homogeneous and heterogeneous catalysis, compounds serving as catalysts for example in olefin polymerization and their physicochemical properties. During the laboratory experiments, the student solves problems in tests and oral discussions in the field of homogeneous and heterogeneous catalysis and methods of chemical compound synthesis and analysis compatible with environmental protection (K_OŚII_W04, K_OŚII_W09). The method of verifying the acquisition of skills: Assessment of the student's involvement in discussions on a research and experimental problems. Students analyse and solve problems and tasks in the field of homogeneous and heterogeneous catalysts and their conditions (K_BChII_U04, K_BChII_U08). Assessment of the safe work during the planning and execution of chemical experiments in the field of various types of catalysis (K_OŚII_K02).

Required courses and introductory requirements**A. Formal requirements**

lack

B. Prerequisites

lack

Aims of education

- familiarize students with the main aspects of homogeneous and heterogeneous catalysis
- familiarize students with mechanisms of the polymerization reaction as an exemplary catalysis reaction, including homogeneous and heterogeneous catalysts
- familiarize students with the methods of synthesis of catalysts, for example post-metallocene catalysts
- familiarize students with the methods of testing the properties of chemical compounds and materials obtained with the use of homo- and heterogeneous catalysis

Course contents

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. 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.

Bibliography of literature

- Literature required to pass the course
- 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.
- Extracurricular readings
- A. A. Shaikh, "Heterogeneous Catalysis", Gruyter, Walter de GmbH, 2020.
- P. W. N. M. van Leeuwen, "Homogeneous Catalysis: Understanding the Art", Springer, 2004.

The learning outcomes (for the field of study and**Knowledge**

<p>specialization)</p> <p>Chemical Business: K_BChII_W01 knows and understands in-depth complex physicochemical processes and is able to analyses their course in connection with other fields of science</p> <p>K_BChII_W06 knows and understands tasks in the field of chemistry, environmental protection and economics that are the subject of human activity to a degree that allows independent work on a research, scientific and measurement position</p> <p>K_BChII_U04 is able to independently plan and perform specific research tasks in the field or in the laboratory, interpret their results working individually or in a team, assuming various roles and functions in it</p> <p>K_BChII_U08 is able to plan and perform specific research tasks in the field and/or in the laboratory, working individually and/or in a team, assuming various roles in it, including managerial ones K_BChII_K02</p> <p>is willing to create and manage group work plans and take responsibility for the work of the entire team, properly assessing his/her own work and that of individual team members</p> <p>Chemistry: K_W01 uses in-depth knowledge of spectroscopic methods of chemical compound analysis</p> <p>K_W04 applies the acquired knowledge to an in-depth description of the properties of chemical connections, methods of their synthesis and analysis</p> <p>K_U01 plans and implements chemical experiments of extended complexity</p> <p>K_U04 applies acquired knowledge of chemistry and related scientific disciplines</p> <p>K_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</p> <p>Environmental Protection: K_OŚII_W04 chooses methods, techniques and research tools used in environmental protection</p> <p>K_OŚII_W09 applies safety and hygiene principles when working independently on a test or measurement stand in a laboratory or in the field</p> <p>K_OŚII_U01 on the basis of the acquired knowledge, proposes to solve environmental problems</p> <p>K_OŚII_K02 recognizes threats, creates safe work conditions and is</p>	<p>Student:</p> <ul style="list-style-type: none"> - 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 - knows the spectroscopic methods of analysis of catalysts and obtained products, oligomerization and polymerization <p>Skills</p> <p>Student:</p> <ul style="list-style-type: none"> - 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 qualify the catalyst to the appropriate group of catalysts in terms of activity - is able to carry out the experiments in accordance with the principle of environmental protection <p>Social competence</p> <p>Student:</p> <ul style="list-style-type: none"> - 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
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responsible for the safety of own and other people's work	
Contact	
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