


KAPITAŁ LUDZKI
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez
 Unię Europejską w ramach
 Europejskiego Funduszu
 Społecznego

UNIA EUROPEJSKA
 EUROPEJSKI
 FUNDUSZ SPOŁECZNY


Nazwa przedmiotu		Kod ECTS	
Laboratory of heterogeneous and homogeneous catalysis		13.3.1220	
Nazwa jednostki prowadzącej przedmiot			
Katedra Technologii Środowiska			
Studia			
wydział	kierunek	poziom	drugiego stopnia
Wydział Chemii	Biznes chemiczny	forma	stacjonarne
		moduł specjalnościowy	wszystkie
		specjalizacja	wszystkie
Wydział Chemii	Chemia	poziom	drugiego stopnia
		forma	stacjonarne
		moduł specjalnościowy	wszystkie
Wydział Chemii	Ochrona środowiska	specjalizacja	wszystkie
		poziom	drugiego stopnia
		forma	stacjonarne
Wydział Chemii	Ochrona środowiska	moduł specjalnościowy	wszystkie
		specjalizacja	wszystkie
Nazwisko osoby prowadzącej (osób prowadzących)			
dr hab. Dagmara Jacewicz, profesor uczelni; dr Joanna Drzeżdżon			
Formy zajęć, sposób ich realizacji i przypisana im liczba godzin		Liczba punktów ECTS	
Formy zajęć		4	
Ćw. laboratoryjne		classes - 30 h	
Sposób realizacji zajęć		tutorial classes - 30 h	
zajęcia w sali dydaktycznej		student's own work - 40 h	
Liczba godzin		TOTAL: 100 h - 4 ECTS	
Ćw. laboratoryjne: 30 godz.			
Termin realizacji przedmiotu			
2023/2024 zimowy			
Status przedmiotu		Język wykładowy	
fakultatywny (do wyboru)		angielski	
Metody dydaktyczne		Forma i sposób zaliczenia oraz podstawowe kryteria oceny lub wymagania egzaminacyjne	
Practical laboratory work - chemical experiments, analysis of obtained results and discussion.		Sposób zaliczenia	
		Zaliczenie na ocenę	
		Formy zaliczenia	
		short test and report from performed chemical experiments.	
		Podstawowe kryteria oceny	

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

- passing short test covering the material of the Laboratory classes
- assessment criteria in accordance with the University of Gdańsk Study Regulations

Sposób weryfikacji założonych efektów uczenia się

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).

Określenie przedmiotów wprowadzających wraz z wymogami wstępnymi

A. Wymagania formalne

lack

B. Wymagania wstępne

lack

Cele kształcenia

- 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

Treści programowe

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.

Wykaz literatury

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.

Kierunkowe efekty uczenia się

Chemical Business:

K_BChII_W01

knows and understands in-depth complex physicochemical processes and is able to analyse their course in connection with other fields of science

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

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

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

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

Chemistry:

K_W01

uses in-depth knowledge of spectroscopic methods of chemical compound analysis

K_W04

applies the acquired knowledge to an in-depth description of the properties of chemical connections, methods of their synthesis and analysis

K_U01

plans and implements chemical experiments of extended complexity

K_U04

applies acquired knowledge of chemistry and related scientific disciplines

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

Wiedza

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
- knows the spectroscopic methods of analysis of catalysts and obtained products, oligomerization and polymerization

Umiejętności

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 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

Kompetencje społeczne (postawy)

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

<p>Environmental Protection:</p> <p>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 responsible for the safety of own and other people's work</p>	
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