KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ SPOŁECZNY

Course title

Chemical equilibria and kinetics in aqueous solutions of coordination compounds

ECTS code

13.3.1215

Name of unit administrating study

null

Studies

faculty	field of study		
Wydział Chemii	Biznes chemiczny	type	drugiego stopnia
		form	stacjonarne
		specialty	wszystkie
		specialization	wszystkie
Wydział Chemii	Chemia	type	drugiego stopnia
		form	stacjonarne
		specialty	wszystkie
		specialization	wszystkie
Wydział Chemii	Ochrona środowiska	type	drugiego stopnia
		form	stacjonarne
		specialty	wszystkie
		specialization	wszystkie

Teaching staff

dr hab. Dagmara Jacewicz, profesor uczelni; dr Joanna Drzeżdżon

Forms of classes, the realization and number of hours

Forms of classes

Laboratory classes

The realization of activities

classroom instruction

Number of hours

Laboratory classes: 30 hours

ECTS credits

4
classes - 30 h
tutorial classes - 30 h
student's own work - 40 h
TOTAL: 100 h - 4 ECTS

The academic cycle

2024/2025 winter semester

Type of course

an elective course

Language of instruction

English

Teaching methods

Practical laboratory work - chemical experiments, analysis of obtained results and discussion

Form and method of assessment and basic criteria for eveluation or examination requirements

Final evaluation

Graded credit

Assessment methods

short test and report from laboratory

The basic criteria for evaluation

Laboratory classes: positive note from an short test with 3-6 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

Required courses and introductory requirements

A. Formal requirements

lack

B. Prerequisites

lack

Aims of education

- familiarize students with the main aspects of chemical kinetics and chemical equilibria
- familiarize students with the determining the rate law of a reaction
- presenting the basis of chemical kinetics calculations
- familiarize students with the factors affecting reaction rate
- familiarize students with the factors influencing the chemical equilibria

Course contents

Chemical equilibria and kinetics in aqueous solutions of coordination compounds. The course aims to provide the basic fundamental knowledge of the kinetic principles to students, necessary to describe and understanding the many processes that occur in water solutions. The laboratory includes the synthesis of coordination compounds of zinc(II), cobalt(III), chromium(III) and studies of their physicochemical properties, for example: solution equilibria determined with several methods, complex formation in equilibria in aqueous solutions. The course also include the study of kinetics of reactions in an aqueous solution with the use of selected coordination compounds, determination of the kinetic equation, determination of temperature dependence of the reaction rate constant and proposing mechanisms of the studied reactions.

Bibliography of literature

Literature required to pass the course
1. Viktor Gutmann, Coordination Chemistry in Non-Aqueous Solutions, Springer Nature Switzerland AG
2. , Chemical Equilibria, Volume 4,
3. James House, Principles of Chemical Kinetics, Academic Press

Extracurricular readings
1. Wright Margaret Robson, Introduction to Chemical Kinetics, John Wiley and Sons Ltd
2. Soustelle Michel, An Introduction to Chemical Kinetics, John Wiley and Sons Ltd
3. Marin, Guy B., Kinetics of Chemical Reactions, Wiley-VCH GmbH
4. Turányi, Tamás, Analysis of Kinetic Reaction Mechanisms, Springer-Verlag GmbH

The learning outcomes (for the field of study and specialization)

Chemical Business:
K_BChII_W01
knows and understands in-depth complex physicochemical processes and is able to analyze their course in connection with other fields of science
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_K04
is willing to properly assess the acquired knowledge, respect it and disseminate it in order to solve specific cognitive and practical issues
Chemistry:
K_W02
has in-depth knowledge in the field of basic chemistry
K_W03
demonstrates in-depth knowledge in the field of modern measuring techniques used in chemical analysis
K_W05
has extended knowledge in the field of the specialization studied
K_U01
plans and implements chemical experiments of extended complexity
K_U02

Knowledge

Students: know formulate definition of reaction rate and know examples of chemical reactions that occur at different rates, identify variables used to monitor reaction rates (i.e change per unit of time, Dx/Dt).Examples: pressure, temperature, pH., know the definitions: zero order reactions, first order reactions, second order reactions, are able to determine the sequence of reactions and are able to assess the influence of factors on the rate of chemical reactions, know main techniques of calculations in chemical kinetics, define and know formulate definition of use terms such as reaction intermediate, activation energy, effective collision, rate-determining step and reaction mechanism, interpret energy diagrams related to kinetics, know interpret energy diagrams related to kinetics, to demonstrate an understanding of the fundamental principles of chemical equilibrium, write the equilibrium expression “K” from a balanced equation relate the magnitude of the equilibrium constant “K” to the relative amounts of products and reactants present at equilibrium.

Skills

Students should be able to:
- explain how a change in concentration, change in temperature, change in pH or a change in pressure influences the rate of a reaction.
- to determine the order of reaction
- determine the value of the rate constant
- fitting the reaction model to the experimental values
- use experimental data to determine the rate law expression and use the data to calculate rate constants and reaction orders
- apply Le Chatelier’s Principle to describe the qualitative changes caused by various stresses on a system
at equilibrium
- use data to calculate the value of K and use the value of K to determine quantities present at equilibrium

critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors 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 Environmental Protection: K_OŚII_W04 chooses methods, techniques and research tools used in environmental protection K_OŚII_U03 plans and performs research tasks in the field or laboratory and interprets research results on environmental issues (working individually or in a team assuming various roles, including managerial functions) K_OŚII_U02 uses advanced measurement and analytical techniques used in environmental protection K_OŚII_K06 recognizes the importance of knowledge in solving encountered cognitive and practical problems and consults experts in the event of difficulties in solving a problem on her/his own	**Social competence** Student: - is active in extending knowledge and understands the need for continuous education - undertakes to work with a new topic or technique - engages in scientific discussions - understands the need to read scientific and popular science journals in order to expand and deepen knowledge - understands the need for lifelong learning, recognizing self-education as a standard and condition for success on the labor market and achieving professional success

Contact

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