KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

UNIA EUROPEJSKA
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FUNDUSZ SPOŁECZNY

Course title	ECTS code
Monographic lecture - Advanced electrochemical methods	13.3.0481

Name of unit administrating study

Faculty of Chemistry

Studies

faculty	field of study		
Wydział Chemii	Chemia	type	drugiego stopnia
		form	stacjonarne
		specialty	chemia biomedyczna, analityka i diagnostyka chemiczna, chemia i technologia środowiska, chemia obliczeniowa
		specialization	wszystkie

Teaching staff

prof. dr hab. inż. Tadeusz Ossowski; dr Iwona Dąbkowska

Forms of classes, the realization and number of hours

Forms of classes

Lecture

The realization of activities

classroom instruction

Number of hours

Lecture: 30 hours

ECTS credits

3
Classes - 30 h
Tutorial classes - 10 h
Student's own work - 35 h
TOTAL: 75 h - 3 ECTS

The academic cycle

2023/2024 summer semester

Type of course

obligatory

Language of instruction

polish

Teaching methods

multimedia-based lecture

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

Final evaluation

Graded credit

Assessment methods

test including open questions

The basic criteria for evaluation

positive assessment: obtaining 51% of points from the written test consisting of 5 open questions (50%) and 20 test questions (50%) covering the issues listed in the lecture program content

Method of verifying required learning outcomes

Required courses and introductory requirements

A. Formal requirements
completed courses in the field of instrumental analysis

B. Prerequisites
the knowledge of basic methods of instrumental analysis
the knowledge of electrochemical theory and laws

Aims of education

- acquaintance with the history of development of electrochemical methods,
- becoming familiar with the theoretical foundations and measuring ranges of electroanalytical methods,
- introduction to selected measurement methods and imaging of various surfaces using electrochemical, optical and combined methods,
- presenting the application of electroanalytical methods to extend complex analytical problems,
- developing the skills of literature searches in the field of electrochemistry

Course contents

(1)Theoretical concepts of electroanalytical methods: interfacial phenomena, the description of the diffusion of substances to the surface of the electrodes, the reversibility of electrode process, Fick's law, the Cotrell's law, modeling of electrodes' processes, electrodes' kinetics, mechanisms of electrodes' processes. Electrochemical measurements in aqueous, non-aqueous and mixed environments.
(2)Voltammetric methods: chronoamperometry, cyclic voltammetry and normal pulse voltammetry. Electrochemical impedance spectroscopy. Voltammetric stripping.
(3)Surface modification: Langmuir-Blodgett, self-organized film on the metal surface (SAM).
(4)Techniques used to characterize monolayers: Raman spectroscopy, confocal and SERS. Spectroelectrochemical measurements. The use of an atomic force microscope (AFM). Automation and computerization of analytical methods.

Bibliography of literature

Literature required to pass the course
Primary literature:
A.1.Literature used during classes:
J. Bard, L. R. Faulkner - Electrochemical methods, Wiley
F. Scholz – Electroanalytical methods, Guide to Experiments and Applications, Springer
Z. Zoski - Handbook of electrochemistry Elsevier
Z. Galus – Elektrochemiczne metody wyznaczania stałych fizykochemicznych, PWN, Warszawa
Kisza – Elektrochemia – cz. I i II, WNT, Warszawa
A.2. Literature for individual studies:
W. Szczepaniak – Metody instrumentalne w analizie chemicznej, PWN, Warszawa

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

Knowledge

1. Define measurement principles and applications of various electrochemical methods.
2. Describe the theoretical principles of electrode processes and their mechanisms.
3. Recognize the types of surfaces obtained as a result of modifications.
4. Determine the physicochemical properties of the modified surface and how it interacts with other compounds.
5. Recognize the relationship between the type of measurement method and the accuracy of the data obtained.
6. Explain the principles of basic surface characterization techniques.
7. Describe the settings and operation of advanced electrochemical and spectroscopic devices

Skills

Social competence

Students will:
1. Understand the need for further education.
2. Independently search for information in the world literature on the latest scientific reports in the field of advanced electroanalytical methods.

Contact

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