



Module name: Interrelation of alloy structure and the electrodeposition mode

Academic year: 2019/2020 Code: ZSDA-3-0244-s ECTS credits: 3

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła Doktorska AGH Specialty: —

Study level: Third-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 0

Course homepage: —

Responsible teacher: dr hab, prof. AGH Żabiński Piotr (zabinski@agh.edu.pl)

Module summary

Electrochemical methods for surface layer modification. Influence of process parameters on morphology and structure of nanometrical size layers of metals. Classification of nonorganic and organic nanomaterials from their structure and physiochemical properties. Scaling of mechanical, electrical, thermic and optic properties of nanoparticles.

Environmental issues related to nanomaterials and nanoparticles.

Examples of testing of materials in nanometrical size and case studies of real examples.

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Skills: he can			
M_U001	Student is able to classify basic types of nanoparticles and nanomaterials. Student is able to describe methods of its synthesis. Student is able to explain correlation between size and properties of nanoparticles.	SDA3A_U03, SDA3A_U02, SDA3A_U01	Presentation
Knowledge: he knows and understands			
M_W001	Student can estimate technological, economic and environmental limitations of production and application of nanolayers	SDA3A_W01	Examination
M_W002	Student knows basic types of nanomaterials and its physiochemical properties. Students knows different classes of nanomaterials from structural and physiochemical properties point of view.	SDA3A_W03	Project

M_W003	Student knows the nature of phenomena at nano scale and understanding correlation between size and particular properties of particles. Understanding of mechanism of interaction nanoparticles with electromagnetic field.	SDA3A_W05	Case study
M_W004	Students knows different methods of organic, nonorganic and hybrid nanomaterials preparation.	SDA3A_W03, SDA3A_W07	Execution of a project

Number of hours for each form of classes

Suma	Form of classes										
	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
30	15	0	0	15	0	0	0	0	0	0	0

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Skills: he can												
M_U001	Student is able to classify basic types of nanoparticles and nanomaterials. Student is able to describe methods of its synthesis. Student is able to explain correlation between size and properties of nanoparticles.	+	-	-	+	-	-	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	Student can estimate technological, economic and environmental limitations of production and application of nanolayers	+	-	-	+	-	-	-	-	-	-	-
M_W002	Student knows basic types of nanomaterials and its physiochemical properties. Students knows different classes of nanomaterials from structural and physiochemical properties point of view.	+	-	-	+	-	-	-	-	-	-	-

M_W003	Student knows the nature of phenomena at nano scale and understanding correlation between size and particular properties of particles. Understanding of mechanism of interaction nanoparticles with electromagnetic field.	+	-	-	+	-	-	-	-	-	-	-
M_W004	Students knows different methods of organic, nonorganic and hybrid nanomaterials preparation.	+	-	-	+	-	-	-	-	-	-	-

Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	30 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	15 h
Realization of independently performed tasks	30 h
Examination or Final test	2 h
Contact hours	5 h
Summary student workload	82 h
Module ECTS credits	3 ECTS

Additional information

Module content

Lectures

Lectures

Electrochemical methods for surface layer modification. Influence of process parameters on morphology and structure of nanometrical size layers of metals. Classification of nonorganic and organic nanomaterials from their structure and physiochemical properties. Scaling of mechanical, electrical, thermic and optic properties of nanoparticles.

Environmental issues related to nanomaterials and nanoparticles.

Project classes

Project classes

A term project will be assigned consisting of an oral presentation and written report. The presentation will be ~20 minute lecture presented by students. Active participation of students – discussion, brain storm.

Teaching methods and techniques:

Lectures: Nie określono

Project classes: Nie określono

Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:

presence on all lectures and project classes

Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:

Lectures:

- Attendance is mandatory: Yes
- Participation rules in classes: Nie określono

Project classes:

- Attendance is mandatory: Yes
- Participation rules in classes: Nie określono

Method of calculating the final grade

0.5 examination grade + 0.5 project grade

Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:

extra project

Prerequisites and additional requirements

Prerequisites and additional requirements not specified

Recommended literature and teaching resources

"Advances in Nanoengineering", A.G.Davies, J.M.T.Thompson (Eds.), Imperial College Press, London 2007

"Nanoparticles and Catalysis", Ed. Didier Astruc, Wiley VCH Verlag GmbH&Co. KGaA, 2008

"Nanotechnologie", R.W.Kelsall, I.W.Hamley, M.Geoghegan (Eds.) PWN, Warszawa 2008

"Nanostructures and Nanomaterials", Guozhong Cao, Imperial College Press, 2004

"Nanotechnology: understanding small systems", B. Rogers, J. Adams, S. Pennathur, CRC Press, 2008

"Single Organic Nanoparticles", H. Masuhara, H.Nakanishi, K.Sasaki (Eds.), Springer 2003

"Molecular Devices and Machines", V. Balzani, M.Venturi, A. Credi, Wiley-VCH 2003

and others available

Scientific publications of module course instructors related to the topic of the module

R. Kowalik, D. Kutyła, K. Mech, T. Tokarski, P. Zabinski; Electrowinning Of Tellurium From Acidic Solutions, Arch. Met. and Mat., 2 (vol 60) (2015), Doi: 10.1515/Amm-2015-0178

R. Kowalik, K. Mech, D. Kutyła, T. Tokarski, P. Żabiński, Magnetic field effect on the electrodeposition of ZnSe, Magnetohydrodynamics 51, No. 2, 345-352, 2015

Kowalik, D. Kutyła, K. Mech, M. Wróbel, T. Tokarski, P. Żabiński, Electrochemical codeposition of molybdenum and selenium, Metallurgy and Foundry Engineering Vol. 41, 2015, No. 1, pp. 7-16

Additional information

None