AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Nazwa modułu: Atomic Force Microscopy and its variants in advanced measurements

Rok akademicki: 2018/2019 Kod: CIM-2-324-BK-s Punkty ECTS: 3

Wydział: Inżynierii Materiałowej i Ceramiki

Kierunek: Inżynieria Materiałowa Specjalność: Biomateriały i kompozyty

Poziom studiów: Studia II stopnia Forma i tryb studiów: Stacjonarne

Język wykładowy: Polski Profil kształcenia: Ogólnoakademicki (A) Semestr: 3

Strona www: —

Osoba odpowiedzialna: dr Niemiec Wiktor (wniemiec@agh.edu.pl)

Osoby prowadzące: dr Niemiec Wiktor (wniemiec@agh.edu.pl)

Krótka charakterystyka modułu

The module presents the Atomic Force Microscopy and a number of selected derivative microscopies and their use in various fields of science.

Opis efektów kształcenia dla modułu zajęć

Kod EKM	Student, który zaliczył moduł zajęć wie/umie/potrafi	Powiązania z EKK	Sposób weryfikacji efektów kształcenia (forma zaliczeń)
Wiedza			
M_W001	Student has knowledge about the principles of operation, advantages and restrictions of various microscopies based on Atomic Force Microscopy.	IM2A_W08, IM2A_W06	Prezentacja
M_W002	Student has knowledge about the use and usefulness of different microscopies based on Atomic Force Microscopy in different fields of science. Student has knowledge which materials and materials' properties can be investigated with these miscroscopies, as well as how to modify the experiments to acquire additional information about sample properties..	IM2A_W02, IM2A_W08, IM2A_W06	
Umiejętności			
M_U001	Student is able to find scientific articles on selected topic and on their basis prepare a presentation in english about the results of various scientific experiments.	IM2A_U01, IM2A_U02	Prezentacja
Kompetencje społeczne			

M_K001	Student is able to formulate a question based on scientific presentation, for which answers can give better insight into discussed topic.	IM2A_K08	Aktywność na zajęciach

Matryca efektów kształcenia w odniesieniu do form zajęć

Kod EKM	Student, który zaliczył moduł zajęć wie/umie/potrafi	Forma zajęć										
		Wykład	Ćwiczenia audytoryjne	Ćwiczenia laboratoryjne	Ćwiczenia projektowe	Konwersatorium	Zajęcia seminaryjne	Zajęcia praktyczne	Zajęcia terenowe	Zajęcia warsztatowe	Inne	E-learning
Wiedza												
M_W001	Student has knowledge about the principles of operation, advantages and restrictions of various microscopies based on Atomic Force Microscopy.	-	-	-	-	-	+	-	-	-	-	-
M_W002	Student has knowledge about the use and usefulness of different microscopies based on Atomic Force Microscopy in different fields of science. Student has knowledge which materials and materials' properties can be investigated with these miscroscopies, as well as how to modify the experiments to acquire additional information about sample properties..	-	-	-	-	-	+	-	-	-	-	-
Umiejętności												
M_U001	Student is able to find scientific articles on selected topic and on their basis prepare a presentation in english about the results of various scientific experiments.	-	-	-	-	-	+	-	-	-	-	-
Kompetencje społeczne												
M_K001	Student is able to formulate a question based on scientific presentation, for which answers can give better insight into discussed topic.	-	-	-	-	-	+	-	-	-	-	-

Treść modułu zajęć (program wykładów i pozostałych zajęć)

Zajęcia seminaryjne

The classes are divided into two parts. The first part consist of a series of lectures about:

- history of microscopy, optical and electron microscopies as basic methods of surface morphology investigation;
- Atomic Force Microscopy, the physics behind the measurements, schematic construction of microscope, working modes, sample properties measured, error sources, sample usage;
- selected derivative microscopies like Electrostatic Force Microscopy, Kelvin Probe Force Microscopy and Tip Enhanced Raman Spectroscopy, the physics behind the measurements, schematic construction of microscopes and their usefulness in different fields of science.

The second part consists of students' presentations about different researches in which Atomic Force Microscopy played a vital role. Students are able to choose articles from any field of science (the one that interests them is recommended).

Sposób obliczania oceny końcowej

Students can earn between 3.0 to 5.0 points for presentation. Additional points can be acquired by:
- answering questions regarding presentation given by the student (0.0-0.2 per answer);
- asking relevant questions after another student's presentation (0.1-0.3 per question);
- being present on every seminar (0.3);
- preparing the presentation for first two seminars with students' presentation (varies).

The points are converted to the closest mark (i.e. 3.0-3.2 points to 3.0, 3.3-3.7 to 3.5, 3.8-4.2 to 4.0, 4.3-4.7 to 4.5 and 4.8+ to 5.0).

Wymagania wstępne i dodatkowe

None.

Zalecana literatura i pomoce naukowe

Review articles about the use of Atomic Force Microscopy methods in different fields of science (the exact articles can vary depending on student's scientific interests).

Publikacje naukowe osób prowadzących zajęcia związane z tematyką modułu

Handke, B., Klita, Ł., Niemiec, W., Self-assembly of dodecaphenyl POSS thin films (2017) Surface Science, 666, pp. 70-75. DOI: 10.1016/j.susc.2017.08.023

Klimek, K., Przekora, A., Benko, A., Niemiec, W., Blazewicz, M., Ginalska, G., The use of calcium ions instead of heat treatment for β-1,3-glucan gelation improves biocompatibility of the β-1,3-glucan/HA bone scaffold (2017) Carbohydrate Polymers, 164, pp. 170-178. DOI: 10.1016/j.carbpol.2017.02.015

Wesełucha-Birczyńska, A., Stodolak-Zych, E., Turrell, S., Cios, F., Krzuś, M., Długoń, E., Benko, A., Niemiec, W., Błazewicz, M., Vibrational spectroscopic analysis of a metal/carbon nanotube coating interface and the effect of its interaction with albumin (2016) Vibrational Spectroscopy, 85, pp. 185-195. DOI: 10.1016/j.vibspec.2016.04.008

Długoń, E., Szymańska, M., Leśniak, M., Jeleń, P., Niemiec, W., Sitarz, M., Investigation on bioactivity of zirconium-calcium coatings on titanium surface obtained by sol-gel and electrophoretic deposition (EPD) methods (2016) Key Engineering Materials, 687, pp. 65-70. DOI: 10.4028/www.scientific.net/KEM.687.65

Wytrwal, M., Koczurkiewicz, P., Zrubek, K., Niemiec, W., Michalik, M., Kozik, B., Szneler, E., Bernasik, A., Madeja, Z., Nowakowska, M., Kepczynski, M., Growth and motility of human skin fibroblasts on multilayer strong polyelectrolyte films (2016) Journal of Colloid and Interface Science, 461, pp. 305-316. DOI: 10.1016/j.jcis.2015.09.039

Dlugon, E., Simka, W., Fraczek-Szczypta, A., Niemiec, W., Markowski, J., Szymanska, M., Blazewicz, M., Carbon nanotube-based coatings on titanium (2015) Bulletin of Materials Science, 38 (5), pp. 1339-1344. DOI: 10.1007/s12034-015-1019-4

Długoń, E., Niemiec, W., Frączek-Szczypta, A., Jeleń, P., Sitarz, M., Błazewicz, M., Spectroscopic studies of electrophoretically deposited hybrid HAp/CNT coatings on titanium (2014) Spectrochimica Acta – Part A: Molecular and Biomolecular Spectroscopy, 133, pp. 872-875. DOI: 10.1016/j.saa.2014.06.064

Kopeć, M., Niemiec, W., Laschewsky, A., Nowakowska, M., Zapotoczny, S., Photoinduced energy and electron transfer in micellar multilayer films (2014) Journal of Physical Chemistry C, 118 (4), pp. 2215-2221. DOI: 10.1021/jp410808z

Plewa, A., Niemiec, W., Filipowska, J., Osyczka, A.M., Lach, R., Szczubiałka, K., Nowakowska, M., Photocrosslinkable diazoresin/pectin films – Synthesis and application as cell culture supports (2011) European Polymer Journal, 47 (8), pp. 1503-1513. DOI: 10.1016/j.eurpolymj.2011.06.002
Wybrańska, K., Niemiec, W., Szczubiałka, K., Nowakowska, M., Morishima, Y., Adenine molecularly imprinted polymer-coated submicrometer silica gel particles (2010) Chemistry of Materials, 22 (18), pp. 5392-5399. DOI: 10.1021/cm100845u
Niemiec, W., Zapotoczny, S., Szczubiałka, K., Laschewsky, A., Nowakowska, M., Nanoheterogeneous multilayer films with perfluorinated domains fabricated using the layer-by-layer method (2010) Langmuir, 26 (14), pp. 11915-11920. DOI: 10.1021/la1012044

Informacje dodatkowe
Brak

Nakład pracy studenta (bilans punktów ECTS)

Forma aktywności studenta	Obciążenie studenta
Udział w zajęciach seminaryjnych	30 godz
Przygotowanie sprawozdania, pracy pisemnej, prezentacji, itp.	20 godz
Udział w lektoratach	25 godz
Sumaryczne obciążenie pracą studenta	75 godz
Punkty ECTS za moduł	3 ECTS