

PHD STUDIES COURSE UNIT DESCRIPTION

Subject	Field of science, code	Faculty / Center	Department
Electrochemical methods of analysis (Electroanalysis)	Chemistry N 003	FTMC	
Student's workload	Credits	Student's workload	Credits
Lectures		Consultations	3
Independent study	7	Seminars	

Course annotation

Electroanalysis and its relation to other analytical methods. Why electroanalysis - practical considerations. Advantages and disadvantages of electroanalysis. Electrode-solution interface. Potentials and thermodynamics of electrochemical cells. Working, supporting and reference electrodes. Electrochemical equilibrium. Kinetics of electrode reactions. Principles of potentiometric measurements. Ion-selective electrodes. Glass electrodes. Microelectrodes, scanning electrochemical microscopy. Electrochemical sensors: biosensors, enzyme-based electrodes. Glucose sensors, ethanol electrodes. Bacteria electrodes. Immunosensors. Gas sensors: CO₂ and O₂ electrodes. Mass transport-controlled reactions, voltammetry, charge transfer kinetics. Electrogravimetry, nanosensors, quartz crystal microbalance.

Reading list

- J. Wang, Analytical Electrochemistry. Second edition. Wiley-VCH. 2000.
- A. J. Bard, L. R. Faulkner, Electrochemical methods. Fundamentals and Applications. Second edition. John Wiley & Sons, Inc. 2001.
- J. M. Diaz-Cruz, N. Serrano, C. Perez-Rafols, C. Arino, M. Esteban. Electroanalysis from the past to the twenty-first century: challenges and perspectives. *J. Solid State Electrochem.* 24 (2020) 2653-2661.
- B. Brunetti. Recent advances in electroanalysis of vitamins. *Electroanalysis* 28 (2016) 1930-1942.
- A. R. Hillman, The EQCM: Electrogravimetry with a light touch. *J. Solid State Electrochem.* 15 (2011) 1647-1660.
- E. Juzeliūnas. Quartz crystal micro-gravimetry: fifty years of application and new challenges. *Chemija* 20(4) (2009) 218-225.

Consulting teachers	Scientific degree	Major publications in the scientific field during last 5 years
Eimutis Juzeliūnas	Habil. dr.	<ol style="list-style-type: none"> 1. E. Juzeliūnas, D. J. Fray. Silicon electrochemistry in molten salts. <i>Chemical Reviews</i> 120, 3 (2020) 1690-1709. 2. L. Štaišiūnas, K. Leinartas, E. Juzeliūnas, D. Bučinskienė, A. Grigucevičienė, P. Kalinauskas, A. Selskis, S. Stanionytė. Anticorrosion performance of hafnium oxide ultrathin films on AZ31 magnesium alloy. <i>Surface and Coatings Technology</i> 397 (2020) 126046. 3. E. Juzeliūnas, D. J. Fray, P. Kalinauskas, I. Valsiūnas, G. Niaura, A. Selskis, V. Jasulaitienė. Electrochemical synthesis of photoactive carbon-carbide structure on silicon in molten salt. <i>Electrochemistry Communications</i> 90 (2018) 6-10.

Konstantinas Leinartas	Dr.	<p>1. L. Staišiūnas, K. Leinartas, E. Juzeliūnas, D. Bučinskienė, A. Grigucevičienė, P. Kalinauskas, A. Selskis, S. Stanionytė. Anticorrosion performance of hafnium oxide ultrathin films on AZ31 magnesium alloy. <i>Surface and Coatings Technology</i> 397 (2020) 126046.</p> <p>2. L. Staišiūnas, E. Juzeliūnas, K. Leinartas, M. Skapas, A. Grigucevičienė, R. Juškėnas, D. Bučinskienė, V. Jasulaitienė. Microgravimetric study of early stages aluminum corrosion in neutral media. <i>Corrosion</i> 75(9) (2019) 1044-1050.</p> <p>3. K. Leinartas, E. Juzeliūnas, L. Staišiūnas, A. Grigucevičienė, P. Miečinskas, J. Vaičiūnienė, V. Jasulaitienė, R. Kondrotas, R. Juškėnas. Mg-Nb alloy films: structure and stability in a balanced salt solution. <i>J. Alloys and Compounds</i> 661 (2016) 322-330.</p>
Rimantas Ramanauskas	Habil. dr.	<p>1. A. Pakalniškis, R. Skaudžius, D. V. Zhaludkevich, A. L. Zhaludkevich, D. O. Alikin, A. S. Abramov, T. Murauskas, V. Y. Shur, A. A. Dronov, M. V. Silibin, A. Selskis, R. Ramanauskas. Morphotropic phase boundary in Sm-substituted BiFeO₃ ceramics: Local vs microscopic approaches. <i>J. Alloys and Compounds</i> 875 (2021) No 159994.</p> <p>2. A. Kirdeikienė, O. Girčienė, L. Gudavičiūtė, V. Jasulaitienė, A. Selskis, S. Tutlienė, M. Skruodienė, J. Pilipavičius, J. Juodkazytė, R. Ramanauskas. Self-healing properties of cerium-modified molybdate conversion coating on steel. <i>Coatings</i>. 11 (2021) 1-15.</p> <p>3. E. Sodaitienė, A. Gefenienė, D. Kaušpėdienė, R. Ragauskas, J. Vaičiūnienė, A. Selskienė, V. Jasulaitienė, R. Ramanauskas. Sustainable removal of anodized aluminum dye by groundwater treatment waste: experimental and modeling. <i>Heliyon</i>, 7 (2021) No. E05993.</p>

Certified during Doctoral Committee session on September 28th, 2021. Protocol No. 610000-KT-142.
Committee Chairman prof. habil. dr. Aivaras Kareiva