

Research group of physical chemistry and electrochemistry

Keywords: physical chemistry, electrochemistry, conducting polymers, scanning electrochemical microscopy, fast Farrier transformation based electrochemical impedance spectroscopy, fuel- and bio-fuel cells, surface modification.



Vilnius University



Research group activities

Our research group is focused on three main topics:

- Synthesis of conducting polymers and evaluation of mechanisms of this synthesis. Conducting polymers are applied in various research areas, sensors, biosensors, batteries, super-capacitors. Therefore it is very important to evaluate polymerization mechanisms of these conducting polymers in order to create new structures suitable for various technological applications with tailored properties.
- Investigation and application of scanning electrochemical microscopy and improvements of scanning electrochemical microscopy, by advanced electrochemical techniques such as fast Farrier transformations. Scanning electrochemical

microscopy is new advanced method which could be applied for electrochemical investigation of sensor and biosensor surfaces, therefore new advances in this research direction could have number of technological and scientific applications.

- Development of biofuel cells based on microorganisms and conducting polymers that could solve some problems in energetics and environmental pollution.



Proposal

- We offer our knowledge and experience in synthesis of conducting polymers, electro-optical, electrochemical quartz-crystal micro-balance based and ellipsometry based measurements for various technological and scientific applications including biotechnological applications and investigations of surfaces.

- We are looking for partners for further improvements of scanning electrochemical microscopy.
- We seek partners for developing competitive research projects targeting HORIZON 2020 and other international programs.



Meet our team

Head - Prof. Habil. Dr. **Arūnas Ramanavičius**. He has research interests in various aspects of nanotechnology, bionanotechnology, nanomaterial, biosensorics, bioelectronics, biofuel cells and MEMS based analytical devices. He is a national coordinator of several nanotechnology related COST actions.

Staff - Assoc. Prof. Dr. **Aušra Valiūnienė** specializes in the study of electrooxidation/electroreduction processes and electrochemical measurement methods.

Assoc. Prof. Dr. **Deivis Plaušinitis**. He has research interests in electrochemistry, bioelectrochemistry, adsorption phenomena, liquid and solid interaction analysis, quartz crystal sensor applications and modernization, biosensors development, radioactive waste management, ion chromatography, mass spectrometry.



Research outcomes

Over 100 research papers in journals referred in ISI database, some patents, research projects related to electrochemistry; over 2800 independent citations, National awards.

- **G. Bagdžiūnas, Š. Žukauskas, A. Ramanavičius.** Insights into Hole Transfer Mechanism between Glucose Oxidase and p-Type Organic Semiconductor. *Biosensors and Bioelectronics* 2018, 102, 449–455.
- **A. Ramanavičius, A. I. Rekertaitė, R. Valiūnas, A. Valiūnienė,** Single-Step Procedure for the Modification of Graphite Electrode by Composite Layer Based on Polypyrrole, Prussian Blue and Glucose Oxidase. *Sensors and Actuators B-Chemical* 2017, 240, 220–223.
- **D. Plausinaitis, L. Sinkevicius, L. Mikoliunaite, V. Plausinaitiene, A. Ramanaviciene, A. Ramanavicius,** Electrochemical Polypyrrole Formation from Pyrrole 'Adlayer'. *Physical Chemistry Chemical Physics* 2017, 19, 1029 – 1038.
- **M.A. Deshmukh, M. Gicevicius, A. Ramanaviciene, M.D. Shirsat, R. Viter, A. Ramanavicius,** Hybrid Electrochemical/ Electrochromic Cu(II) Ion Sensor Prototype Based on PANI/ ITO-Electrode. *Sensors and Actuators B Chemical* 2017, 248, 527–535.
- **I. Morkvenaite-Vilkonciene, A. Ramanaviciene, A. Ramanavicius,** 9,10-Phenanthrenequinone as a Redox Mediator for the Imaging of Yeast Cells by Scanning Electrochemical Microscopy. *Sensors and Actuators B Chemical* 2016, 228, 200–206.
- **A. Ramanavicius, A. Kausaite-Minkstimiene, I. Morkvenaite-Vilkonciene, P. Genys, R. Mikhailova, T. Semashko, J. Voronovic, A. Ramanaviciene,** Biofuel Cell Based on Glucose Oxidase from *Penicillium Funiculosum* 46.1 and Horseradish Peroxidase. *Chemical Engineering Journal* 2015, 264, 165–173.
- **D. Plausinaitis, V. Ratautaite, L. Mikoliunaite, L. Sinkevicius, A. Ramanaviciene, A. Ramanavicius,** Quartz crystal microbalance based evaluation of electrochemical formation of aggregated polypyrrole particle based layer. *Langmuir* 2015, 31 (10), 3186-3193.



Resources

Research group has complete infrastructure for synthesis of new functional organic materials and characterization of physicochemical properties, development of scientific competence in the field of nanoscience and nanotechnologies as well as creation of scientific background for molecular

nanoelectronics, nanobiotechnology and nanosensorics and their application to the development of modern technologies. It owns a high number of state-of-art equipment dedicated for the synthesis and characterization of materials.



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