Level: master

Course title: Analytical Voltammetry

Status: elective

ECTS: 5

Requirements: none

Learning objectives

Broadening knowledge about the physical, physico-chemical, biochemical and instrumental principles of analytical voltammetry. Introduction to the role, significance, design and implementation of voltammetric sensors for *on-line*, *in-situ* or *in-field* measurements. Training students in practical skills which enable professional and independent handling of instruments during the voltammetric trace level analysis of target analytes. Developing students' ability to independently solve problems related to the design and application of voltammetric sensors during the execution of the analysis.

Learning outcomes

Applying the knowledge about analytical voltammetry and voltammetric sensors during the execution of the analysis. Selecting the appropriate measurement technique and methodology for solving complex analytical problems in laboratory and fieldwork. Independent and competent handling of voltammetric sensors in analyzing different samples. Select, optimize, modify and adapt appropriate methods (square wave voltammetry, chronoamperometry, cyclic voltammetry, inverse voltammetry etc.) when performing voltammetric analysis. Objectively evaluate and present research results.

Syllabus

Theoretical instruction.

Basics of voltammetric measurements. Voltammetric equipment. Working electrodes: mercury, solid electrodes (carbon-based, metals and composites). Chemical modification of the electrodes (self organization of monolayers, sol-gel encapsulation of target analytes, pre-concentration on the electrodes, permeable selective layers, conducting polymers, ionic liquids). Voltammetric biosensors: enzyme based electrodes, DNA sensors, etc. Bulk modified electrodes. Classical voltammetric techniques. Pulse techniques: differential pulse voltammetry, square wave voltammetry, etc. Stripping voltammetry (anodic, cathodic, adsorptive). Flow analysis (FIA and HPLC) coupled with voltammetric detectors. *On line* and *in vivo* measurements. Miniaturization.

Practical instruction

Possibilities of modification of electrode surfaces. Voltammetric determination of lead and cadmium in blood/urine. Voltammetric measurement of oxygen. Amperometric determination of glucose in blood. Voltammetric determination of zinc in different pharmaceuticals. Voltammetric determination of the selected insecticide in honey.

Weekly teaching load				Other:
Lectures: 2	Exercises: 2	Other forms of teaching:	Student research:	