



Electrochemical methods

(3 CFU: 14h theory + 15h labs)

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lecture period: February 2025

PROGRAMME OF THE COURSE

Basic Electrochemistry

- Redox reaction; Standard potentials, Reference electrodes; Electrochemical cells, lead acid battery
- Nernst equations, Pourbaix diagrams; Diffusion at electrode and Cottrell equation;
- Kinetics and energetics of electrode reactions, Butler-Volmer equations; electrode interface (double layer)
- Electron transfer theory: Marcus and Gerischer models

Electrochemical methods

- EC methods; single and multiple potential step (chronoamperometry) and potential sweep (Linear sweep voltammetry, Cyclic Voltammetry, Square Wave Voltammetry)
- EIS: Electrochemical impedance spectroscopy, Randles circuit model, Warburg element

Laboratory experience

- electrochemical cell, reference electrode, counter electrode
- CV: Nernst equation, effect of scan rate, Randles-Sevcik
- Water splitting cell; Hydrogen and Oxygen evolution reactions; Tafel slope
- Electrochemical impedance spectroscopy
- Mott-Shottky methods
- Energy storage: batteries and capacitors; Dunn method

BIBLIOGRAPHY

- K. B. Oldham, J. C. Myland – Fundamentals of Electrochemical Science – Academic Press
- A. Bard, L. Faulkner - Electrochemical Methods, Fundamentals and Applications – John Wiley & Sons
- R. Memming - Semiconductor Electrochemistry - Wiley-VCH