

Project 3.7 Paper-based liquid-liquid electrochemistry.

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Unit: Charge Transfer Processes in Hydrodynamic Systems

WWW: www.charge-transfer.pl

Background:

The basis for electrochemistry at the interface between immiscible liquids is the difference in solvation energy of different chemical species in different solvents. A large number of compounds of very different structures have been detected using ion transfer at an ITIES, from small inorganic ions, drugs (both legal and illicit), neuro-trans-mitters, and environmental pollutants up to large proteins. In many cases, the sensitivity is excellent, with limits of detection well within relevant analytical boundaries, in some cases as low as picomoles per litre.

Traditionally, studies of electrochemistry at ITIES are performed in macroscopic glass cells in a 4-electrode setup with counter and reference electrodes at either side of the liquid-liquid interface. In this project we want to perform liquid-liquid electrochemistry in a paper-based setup. Paper has been used in analysis for centuries as the basis for chromatography, but as a support for modern analytical chemistry its use has increased dramatically over the last decades. For the current project, the most important function of paper is its ability to support a liquid within the fibre structure of the paper. The paper can also work as a transport channel to move a liquid sample from one point of the support to a readout or reaction zone in a controlled manner.

Aim:

The main scientific goal of the proposed project is to develop and evaluate sensors based on transfer of ions across the interface between two immiscible electrolyte solutions (ITIES) in paper-based systems. Ion-transfer voltammetry possesses a clear potential as a system for detection of analytes that are not electrochemically active. As such it complements, and can be combined with, traditional electrochemical approaches to sensing.

Requirements:

- MSc diploma in chemistry, chemical engineering, physics or similar
- Creativity measured by the quality and number of projects, study record, internships, authorship in peer-reviewed publications and patents in which the Candidate participated and contributed.
- Good technical skills.
- Knowledge in physical chemistry.
- Previous knowledge of liquid-liquid electrochemistry and/or paper-based electrochemistry is a plus.
- Excellent communications, organization and time management skills.
- Ability to work independently as well as in a group.
- Analytical thinking and critical problem solving skills.
- Good knowledge of spoken and written English