

**mgr inż. Dawid Kaluża**

**PhD thesis abstract „Electrochemical processes at liquid|liquid interfaces in microfluidic systems”.**

**Supervisor: dr hab. Martin Jönsson-Niedziółka, prof. IChF PAN**

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The scientific goal of this doctoral dissertation is to examine and understand the basic electrochemical processes that occur at liquid|liquid interfaces in microfluidics. The performed research shows the possibilities of using an electrochemical microfluidic device (EMD). The microfluidic system consisted of a microchannel made with polydimethylsiloxane (PDMS) material and a glass slide contained a sputtered gold electrode system: working, reference and counter, respectively. In the some parts of measurements a silver-silver chloride reference electrode was used. The characteristic feature of these experiments was presence of three-phase boundary located between the working electrode and two immiscible flowing liquid phases.

In the first part of work, the verification of PDMS material compatibility on different organic solvents, it was determined that *N*-octyl-2-pyrrolidone organic solvent (NOP) used in this thesis does not destroy and deform the PDMS microchannel structure and in fact it does not have an impact on electrochemically oxidation of ferrocene (Fc). Also examined was the unusual behavior of the transfer limited current accompanied with the oxidation of Fc and the three-phase boundary was monitored in the function of different flow conditions.

In the next part of thesis, the ion transfer reactions across liquid|liquid interfaces under microfluidic conditions were studied in presence of wide range of anions dissolved in the aqueous phase. The obtained results were in good agreement with the thermodynamic theory of ion transfer processes valid under static three-phase electrode (TPE) and they could be analyzed using a Nernst-like equation. It has been noticed that in presence of more hydrophobic anions in the aqueous phase, during oxidation of decamethylferrocene (DMFc) in the organic phase under the microfluidic control, the transfer of anions to the organic phase occurs according to Nernst-like equation.

The last part of the work is related to electromediated oxidation of diphenylcarbinol (DPC) to benzophenone (BP). It has been shown that various type of (2,2,6,6-Tetramethylpiperidin-1-yl)oxyl (TEMPO) mediator operates at different speeds in conversion of DPC to BP. The obtained results with different TEMPO mediators are good starting point

to transfer these experiments to electrochemical microfluidic device which allows to increase the delivering of mediator via convective way of transport.

All results of this dissertation bring a valuable knowledge in electrochemistry at the liquid|liquid interfaces with microfluidics. Electrochemical microfluidic device can be used as a useful platform which can be employed towards more oriented practical applications e.g. construction of microdevice for analysis of aqueous solutions of anions.