Zdenek Slouka, J Membra Sci Technol 2017, 7:2 (Suppl)
DOI: 10.4172/2155-9589-C1-002

## Electrochemistry, electrokinetics and microCT analysis of heterogeneous ion-exchange membranes

**Zdenek Slouka**
University of Chemistry and Technology, Prague, Czech Republic

Heterogeneous ion-exchange membranes are industrially important separation media used in electromembrane separation processes such as electrodialysis and electrodeionization. They consist of a functional component (milled ion-exchange resin) providing required selectivity and nonfunctional components (binder, polymeric mesh) providing physical embodiment and mechanical strength of the membrane. The production of these membranes does not allow one to control precisely the distribution of functional ion-exchange resin within the nonconductive binder. However, the structure of the membranes plays important role in their performance and in turn of the whole electromembrane separation units. We developed an experimental system that allows us to investigate a rather small piece of a heterogeneous ion- exchange membrane by performing different types of experiments: (i) standard electrochemical characterization (current-voltage characteristics, chronoamperometry, chronopotentiometry); (ii) optical and fluorescent observation of processes occurring at the membrane – electrolyte interfaces; and (iii) 3D reconstruction of the same piece of the membrane in its fully swollen state by micro-computed tomography. We process all experimental data together and look for links between the observed behavior and the structure of the membrane, such as surface area of conductive domains and transition times, the structure of the membrane and conductivity, the structure of the membrane and the occurrence of mechanisms driving overlimiting electrical currents. The occurrence of the over limiting current is a subject of tumultuous scientific debates and the general scientific consensus is that there is no single mechanism. In our case we mainly study electroconvection and water splitting as phenomena allowing current larger than the limiting one to go through the system.

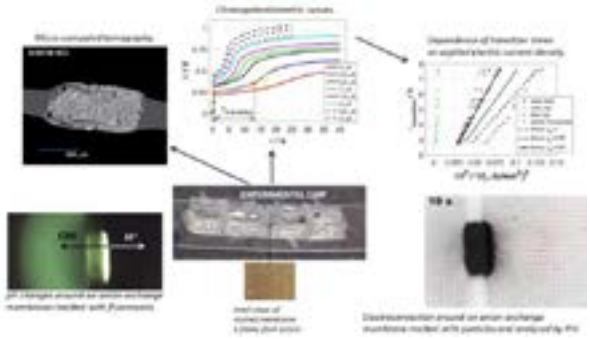

Figure 1: The figure shows our experimental approach to studying the effects of membrane structure on its behavior.

### Biography

Zdenek Slouka holds a position of an Associate Professor (starting June 1st 2017) in the Dept. of Chemical Engineering at the University of Chemistry and Technology Prague. He earned his MSc and PhD in Chemical Engineering at the same university in 2004 and 2008, respectively. He received a two-year Postdoctoral Training studying the invasion of red blood cells by malaria parasites under the supervision of Kasturi Haldar who is a Professor in the Department of Biological Sciences at the University of Notre Dame, USA. He then followed as a Postdoctoral Fellow in Prof. Hsueh-Chia Chang Laboratory at the University of Notre Dame. During his second Postdoctoral Training, he focused on development of point-of-care diagnostics platforms based on the use of heterogeneous ion-exchange membranes. His research interest include microfluidics, microfluidic fabrication technologies, electrokinetics, electrochemistry, electromembrane separation, and biosensing.

sloukaz@vscht.cz

Notes: