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Biomimetic Interfaces in Solution for Sustainable Ion Gradient and Biocompatible Logic Operation

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In our work we summarize the achievements and discuss perspectives of chemical systems in solution for information processing. Chemical computing systems working in aqueous environments provides possibility to design biocompatible logic circuits overcoming physical and technological limitations of classical semiconductor logic devices. In living cells transduction and processing of information is caused by ion transport across cell membranes. Finding inspiration in nature we suggest using electrochemically and photo electrochemically generated ion fluxes [1-5] for constructing basic logic gates. Layer-by-layer assembled polyelectrolyte multilayers [2-7] allow to perform fine tuning of ionic fluxes through membrane. Spatial and temporal distribution concentration of particular ions in close proximity to the surface of electrode were investigated using Scanning Vibrating Electrode Technique (SVET) and Scanning Ion-Selective Electrode Technique (SIET) unique tool for characterization of local ionic currents in solution and ion concentration gradients measurement respectively [1, 2]. Based on obtained results we present model electrochemical system allowing to perform simple Boolean operations using ions as input or/and output signals and suggest concept of light-driven chemical logic gates. Taking into account growing interest to biocompatible neuro interfaces providing solution of challenging task neuron-mimic information processing, we believe that the discussed findings and perspectives will appeal to broad interest of interdisciplinary audience of Biotech 2019.

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Biography:

Ekaterina V. Skorb is a Professor at ChemBio Cluster at ITMO University working on different projects from the synthetic cell and biofilm programming to smart dynamic materials and system for personal diagnostics, study and modeling of nonlinear chemical processes. She received her Ph.D with "summa cum laude" in physical chemistry (2008). From 2013 she was a group leader at Biomaterials Department at the Max Planck Institute of Colloids and Interfaces (MPIKG, Germany). She was a Visiting Scholar at Chemistry and Chemical Biology Department (Harvard, USA) in Prof. Whitesides group (2016-2017). Ekaterina has authored more than 80 research papers and received various fellowships. (e.g. L'Oréal UNESCO, AvH, DAAD, LG Chem, etc)