LECTURE

VISITING PROFESSOR PROGRAMME

prof. Tamás Pajkossy

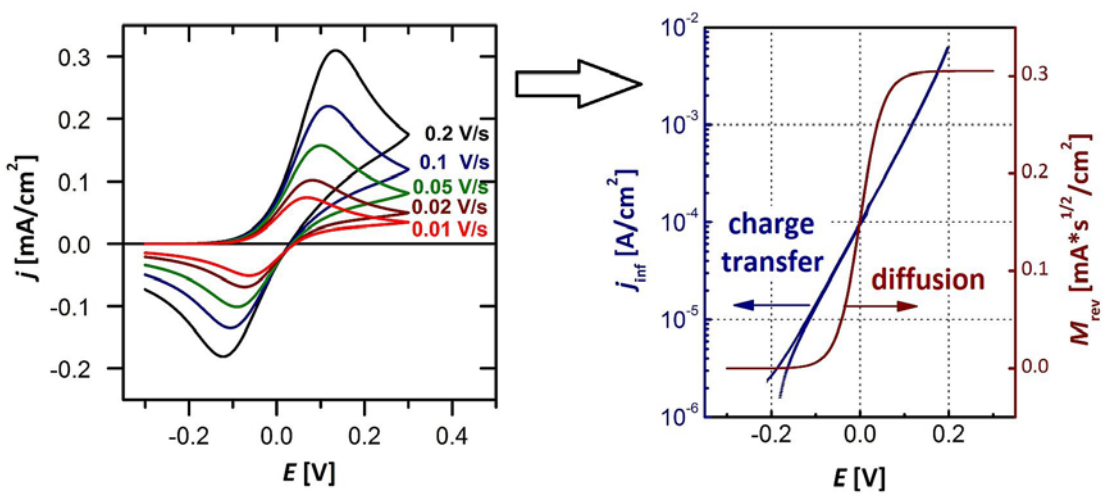
Hungarian Academy of Sciences, Budapest, Hungary

will deliver a lecture titled:

Analysis of voltammograms and impedance spectra of quasi-reversible redox system: transformation to program independent form

DATE: 4 September 2019 | from 9.00 till 10.00 ***VENUE:*** CNBCh UW, sem. room: 0.38

ABSTRACT:
A simple procedure is suggested by which cyclic voltammograms, CVs, pertinent to partially diffusion controlled charge transfer reactions can be analyzed. By this procedure, from a set of CVs taken at varied scan rates, two scan-rate independent, hysteresis-free functions can be calculated. One of them is the diffusion-free polarization curve, $j_{inf}(E)$, the other is the semiintegrated form of the reversible CV, $M_{rev}(E)$.



By analysing the electrochemical impedance spectra (EIS) of quasi-reversible redox systems, the two elements of the Faradaic impedance: charge transfer resistance and the coupled Warburg-coefficient can be obtained at a given potential. The same applies also to DEIS (dynamic EIS) measurements, when high frequency impedance spectra are measured while the potential is scanned to simultaneously accomplish cyclic voltammetry or other transient measurements. In case of DEIS both the charge transfer resistance and the Warburg coefficient depend on the applied potential program, e.g. on scan-rate. A theory is presented, yielding a transformation by which this dependence can be eliminated. The proposed procedure yields two, scan-rate independent, hysteresis-free functions, which are closely related to the EIS results, and also to the functions which are the transformed forms of the cyclic voltammograms (see the above plots).

In the lecture the mathematics of these ideas are presented illustrated with simulation results.

Areas of professional interest are related to electrochemistry as:

- connection of electrode kinetics and electrode geometry in general (1983-) and connection of electrochemistry and fractal geometry in particular (1983-1990)
- double layer properties of metal electrodes, with and without adsorption effects (1994-)
- perturbation methods and related instrumentation (1981-); dynamic electrochemical impedance spectroscopy (2015-) – and as a byproduct of these studies: development of various test instruments for the Hungarian lamp industry (1977-2005)

University of Warsaw
Biological and Chemical
Research Centre