School of Nano Science

School of PHYSICS

IPM Condensed Matter & Statistical Physics Group

Weekly Seminar

Plasmonic Imaging of the Interfacial Potential Distribution on Bipolar Electrodes

Invited Speaker:

Dr. Meisam Hasheminejad

School of Chemistry and Chemical Engineering, State Key Laboratory of Analytical Chemistry for Life Science, Nanjing University, Nanjing(China)

Abstract:

Bipolar electrochemistry is based on the gradient distribution of free-electron density along an electrically isolated electrode, which causes a positive electrode potential at one end and a negative potential at the other, allowing for wide applications in analytical chemistry and materials science.

To take full advantage of its wireless and high-throughput features, various types of optical probes, such as pH indicators and fluorescence and electrochemiluminescence reagents, have often been used to indirectly monitor the interfacial electron transfer through chromogenic or fluorogenic reactions. Herein, we report the first probe-free imaging approach that can directly visualize the distribution of the interfacial potential in bipolar electrodes, providing essential information for the validation and development of the theory and applications of bipolar electrochemistry. This approach is based on the sensitive dependence of surface plasmon resonance imaging on the local electron density in the electrode, which enables the direct mapping of potential with a spatial resolution close to the optical diffraction limit, a temporal resolution of 50 ms, and a sensitivity of 10 mV. In addition, in contrast to previous optical readouts that relied on faradaic reactions, the present work achieved the impedance-based measurements under nonfaradaic conditions. It is anticipated that this technique will greatly expand the application of bipolar electrochemistry as a platform for chemical and biosensing.

Wednesday, 22 Shahrivar 1396 (Sep . 13, 2017), 14:00-15:00

Seminar Room (classroom A), Farmanieh Building, IPM