Grand Technion Energy Program
תכנית האנרגיה ע"ש גרנד

הטכניון מכון טכנולוגי לישראל
TECHNION Israel Institute of Technology

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Katharina Krischer is a Professor of Physics at the Technical University of Munich, Germany. She is also a member of the Catalysis Research Center of TUM and serves on editorial boards of several journals on electrochemistry or nonlinear sciences. She did her Ph.D. at the Fritz-Haber-Institut, Berlin, in the group of nobel laureate Prof. Ertl. After postdoctoral training at Princeton University, USA, she returned as a group leader to the Fritz-Haber-Institut, and completed her habilitation in 1998. In 2002 she moved to Munich to take on her current position. Her research interests cover two broad topics, electrochemistry and nonlinear dynamics. She works on photoelectrochemistry, solar fuels and semiconductor electrochemistry as well as on nonlinear phenomena during electrochemical reactions. Furthermore, she has also a strong interest in theory, bridging the gap between physico-chemical continuum models describing self-organization phenomena at the solid-liquid interface and normal form approaches and abstract mathematical models. She has coauthored about 130 publications in peer-reviewed journals and a text book on ‚Physics of Energy Conversion'. She was elected a fellow of the International Society of Electrochemistry and is a member of the German Physical Society (DPG) and the Society of German Chemists (GDCh). In 2018 she received the 'Supervisory Award' for excellent supervision of Ph.D. students.

Will lecture on:

Spatially distributed reaction rates in (photo)electrocatalysis

In photo- and electrocatalysis it is often assumed that the global reaction rate, for example measured as a total current, scales linearly with the total catalytic area. In the talk I will discuss two fundamentally different situations in which this simple superposition principle is violated.
First, I will consider the (photo)electrochemical reduction of water and CO2 at MIS (metal-insulator-semiconductor) microelectrode arrays. More specifically, I will present experiments with regular Au/Ti and Cu/Au/Ti micro- and nanoarrays on SiO2-Si substrates for various sizes of the metal patches. I will discuss a non-trivial influence of the sizes of the nanostructures (at constant total area) on the total current, and I will give possible explanations of the observed non-trivial scaling behavior.
Second, I will present results on the oxidation of CO on a Pt electrode in an acidic electrolyte. It is well known that this system exhibits bistable reaction rates under voltage control, i.e., depending on the initial condition, the system might be in a reactive or a passive state for identical external parameters. Using spatially resolved FTIR spectroscopy, I demonstrate that these two states coexist on the electrode under current control. Furthermore, spatio-temporal reactivity patterns evolve when specifically adsorbing anions, such as chloride or bromide, are present in the electrolyte. Among these patterns are reactivity pulses traveling across the electrode with a constant speed. The interaction between the two pulses exhibits soliton-like behavior.

Sunday, February 17th, 2019, 10:30am

Wolfson Department of Chemical Engineering

Lecture Hall 6, 2nd floor

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