

# UniCat Colloquium

Note Updates: [www.unicat.tu-berlin.de](http://www.unicat.tu-berlin.de)

- Lecturer:** Prof. Dr. Elena A. Baranova, Department of Chemical and Biological Engineering, University of Ottawa, Canada
- Title:** **Inducing Electrochemical Promotion of Catalysis (EPOC) with Au and Pt Nanoparticles Interfaced with Yttria-Stabilized Zirconia (YSZ) solid-electrolyte**
- Abstract:** Electrochemical Promotion of Catalysis (EPOC) or Non-faradaic Electrochemical Modification of Catalytic Activity (NEMCA) effect can be applied to modify both the activity and the selectivity of heterogeneous catalysts. The effect is rather general and was studied for more than 90 catalytic reactions and a variety of solid electrolytes. EPOC or NEMCA refers to the pronounced and reversible changes in the catalytic properties of conductive catalysts deposited on solid electrolytes caused by the application of a small (in the range of microamperes) electrical current or potential. The significant and often highly non-faradaic increase in the catalytic reaction rate, as well as the enhancement of product selectivity that are induced when applying a very low electric current, are reversible and return to the value observed prior to application of the electric stimulus. The effect has been shown via several surface spectroscopic and electrochemical techniques to be caused by electrochemically controlled migration (back spillover) of promoting ionic species (e.g.,  $O^{2-}$ ,  $Na^{\delta+}$ ,  $K^{\delta+}$ , etc.) from the solid electrolyte to the metal gas interface. These back spillover ionic species form an overall neutral double layer at the metal/gas interface and affect catalytic rates by modifying the binding energy of chemisorbed reactants and intermediates via electrostatic interaction. One of the factors that limit commercialization of EPOC is the use of low dispersion ( $\leq 10\%$ ) catalysts in the form of a continuous layer used in most of the previous electrochemical promotion studies. Therefore, EPOC of nanostructure highly dispersed catalysts is of great interest. First, the concept of EPOC phenomenon and its origin will be presented, following by the discussion of electrochemical promotion studies at the Rh nanofilm catalyst, as well as Au and Pt nanoparticles interfaced with yttria-stabilized zirconia (YSZ) solid electrolyte for the model reactions of ethylene and carbon monoxide oxidation.
- Date:** **Wednesday, 6 July 2011**
- Time:** **5:15 pm - around 6:45 pm**
- Location:** **TU Berlin, Institute of Chemistry,  
Straße des 17. Juni 115, 10623 Berlin,  
Building C, Lecture Hall C 243**
- Organiser:** Prof. Dr. Peter Strasser (TUB)  
Coffee and tea will be served thirty minutes prior to the lecture start.  
Guests are cordially invited to attend!