TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

INSTITUT FÜR ANGEWANDTE PHYSIK
Institute of Applied Physics
vormals/formerly
Institut für Allgemeine Physik

Wiedner Hauptstraße 8-10/E134, 1040 Wien/Vienna, Austria – Tel: +43 1 58801 13401 / Fax: +43 1 58801 13499 – E-mail: office@iap.tuwien.ac.at / http://www.iap.tuwien.ac.at

IAP-SEMINAR

EINLADUNG

*** ACHTUNG SONDERTERMIN ***

Termin: **Mittwoch, 18.12.2013 um 14:00 Uhr**

Ort: **Technische Universität Wien,**
GM 5 Hörsaal Chemie, Hoftrakt
Ersatz: Bauteil BE, Lückenbau, 1. Stock, Raumnummer BE0101
1060 Wien, Getreidemarkt 9

Vortragende: **Ass.Prof. Bilge Yildiz**
Massachusetts Institute of Technology, Department of Nuclear Science and Engineering Cambridge/USA

Thema: **Dissimilar oxide interfaces to accelerate oxygen reduction kinetics**

Kurzfassung

Interfaces between dissimilar oxides are attracting significant interest for their potential role in accelerating charge transport and surface reaction kinetics. If well understood and controlled, they can provide a new way to enable high-performance solid-oxide fuel cells, separation membranes as well as fast switching memristors. For example, recent studies have demonstrated that cobaltite hetero-interfaces exhibit orders of magnitude faster oxygen reduction kinetics compared with either single phase. The interfacial strain fields, anisotropy, and electronic interactions between the two phases are the likely mediators behind such an unprecedented enhancement. The underlying mechanisms must be understood quantitatively, so that we can go beyond isolated and empirically found interface structures to rationally designing dissimilar oxide interfaces with superior properties. Towards this goal, we have investigated the local electronic structure at nanometer resolution in model multilayer superlattices and vertical nanostructures that are made of dissimilar cobaltites. To accomplish this, we used a novel combination of *in-situ* scanning tunneling spectroscopy and focused ion beam milling. We found that the wide band-gap cobaltite is electronically activated at elevated temperatures through an interfacial coupling with a reducible cobaltite. Such electronic activation is expected to facilitate charge transfer to oxygen, and accelerate the reduction kinetics on the surface. Furthermore, based on our computational and experimental work, we have put forth elastic strain to be an important driver of the kinetics of surface reactions and diffusion in functional oxides, and demonstrated these concepts on fluorite, perovskite and Ruddlesden Popper structures. There remains still a large amount of open questions on how dissimilar oxide interfaces impact oxygen diffusion and oxygen exchange on the surfaces. However, these recent results are encouraging for an improved understanding of oxide hetero-interfaces at elevated temperatures and could enable new interfaces with fast oxygen transport and oxygen reduction kinetics.

Alle interessierten Kolleginnen und Kollegen sind zu diesem Seminar
(45 min mit anschließender gemeinsamer Diskussion) herzlich eingeladen.

U. Diebold e.h.
(Seminar-Chairperson)

H. Störi e.h.
(LVA-Leiter)