Novel, highly conductive Pt/TiO\textsubscript{2} thin-film model catalyst electrodes: 

The role of metal-support interactions

C. Gebauer, D. Hoffmann, Z. Jusys and R. J. Behm

Institute of Surface Chemistry and Catalysis, Ulm University, D-89069 Ulm, Germany

Abstract

Aiming at a better understanding of metal–support interactions in oxide supported Pt electrocatalysts, we have prepared and characterized planar Pt/TiO\textsubscript{2} model catalyst electrodes, which combine high conductivity and direct Pt–TiO\textsubscript{2} interactions. These consist of a thin TiO\textsubscript{2} film on a glassy carbon (GC) substrate and Pt nanoparticles on top. TiO\textsubscript{2} films were deposited via a potential induced sol-gel process and subsequently functionalized by Pt nanoparticles, by electrochemical Pt deposition, by deposition of pre-formed Pt nanoparticles or by photo-assisted local reduction of Pt ions. Scanning electron microscopy, transmission electron microscopy and X-ray photoelectron spectroscopy were employed for structural and electronic characterization of the model catalyst electrodes, cyclic voltammetry, electrooxidation of pre-adsorbed CO and O\textsubscript{2} reduction for evaluating their electrochemical / electrocatalytic properties. The impact of the Pt deposition method, of particle size effects and of metal–support interactions on the electrochemical properties and the catalytic activity / selectivity of these systems is discussed.

Keywords: Model electrode, electrodeposition, CO electro-oxidation, O\textsubscript{2} electro-reduction, Pt, TiO\textsubscript{2}

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* Author to whom correspondence should be addressed, email: juergen.behm@uni-ulm.de