

CO OXIDATION ON A CeO_x/Pt(111) INVERSE SUPPORTED CATALYST: PROMOTIONAL EFFECTS AND REVERSIBLE REDOX BEHAVIOUR

R. Wrobel, Y. Suchorski, S. Becker, B. Strzelczyk and H. Weiss, *Chemisches Institut, Otto-von-Guericke-Universität Magdeburg, Universitätsplatz 2, D-39106 Magdeburg, Germany*

By creating conditions at which self-organization occurs, nanoscaled structures may be assembled on catalytically active metal surfaces. Apart of nonisotropic strain as in the case of the Cr/Pt(111) system [1], long-ranging adatom interaction mediated by the electronic system of the substrate appears to be a promising driving force for such a self-assembling of "metals on metals" [2].

In the present contribution we report about a first attempt to create a well-defined CeO_x/Pt(111) model catalytic system by deposition and self-assembling of Ce adatoms via long-ranging adatom interaction at low temperature, followed by a subsequent partial oxidation of the nucleating Ce submonolayer during warming to room temperature. The resulting system of the "inverse supported catalyst" type consists of nanosized CeO_x formations (2D islands of 5-15 nm size) more or less uniformly distributed over the Pt(111) surface, as controlled by STM and XPS. The CeO_x/Pt(111) system has been tested in the CO oxidation reaction whereas both the CO₂ reaction rate and Ce oxidation state were monitored *in situ*. An enhanced reactivity of the CeO_x/Pt(111) system and a remarkable shift of the bistable region of the reaction towards higher CO pressures was observed when compared to a clean Pt(111) surface. The CeO_x islands exhibit a pronounced redox behaviour that follows the hysteresis cycle of the reaction. The usefulness of this "inverse model catalyst" for studying the oxygen diffusion supply and the redox behaviour of ceria in the ceria-Pt catalysts is demonstrated.

[1] L.P. Zhang, J. van Ek and U. Diebold, *Phys. Rev. B* **59**, (1999) 5837.

[2] F. Silly, M. Pivetta, M. Ternes, F. Patthey, J.P. Pelz, and W.-D. Schneider, *Phys. Rev. Lett.* **92**, (2004) 016101.

OXIDATION OF Ce OVERLAYERS ON Cu(111): AN XPS, LEED, AES AND STM STUDY

R. Wrobel, Y. Suchorski, S. Becker, and H. Weiss, *Chemisches Institut, Otto-von-Guericke-Universität Magdeburg, Universitätsplatz 2, D-39106 Magdeburg, Germany*

Cerium submonolayers (<1 ML) and multilayers (6-12 ML) deposited on a Cu(111) single crystal surface were studied by XPS, AES, LEED and STM. The obtained Ce layers were subsequently oxidized and the oxidation process monitored *in situ* by XPS. The oxidation of thicker Ce overlayers provides epitaxial ceria layers of corresponding thickness, as evidenced by LEED and XPS. Present method of epitaxial ceria layers fabrication is confronted with recent results for reactive cerium evaporation on Cu(111) in oxygen atmosphere [1]. A direct comparison of the behaviour of adsorbed Ce and the initial stages of ceria formation on Cu(111) and Pt(111) surfaces has also been performed and is discussed.

[1] V. Matolín, J. Libra, I. Matolínová, *Proceedings of the 13th International Conference on Solid Films and Surfaces, San Carlos de Bariloche, Argentina, Appl. Surf. Sci.* 2006, in print.