Contribution submission to the conference Regensburg 2022

The relation between structure sensitivity and doping of ceria(111) vs. ceria(100) — Emilia Pozarowska[1], Linus Pleines[2], Mauricio J. Prieto[3], Liviu C. Tănase[3], Lucas de Souza Caldas[3], Aarti Tiwari[3], Thomas Schmidt[3], Jens Falta[2], Carlos Morales[1], and •Jan Ingo Flege[1] — [1]Applied Physics and Semiconductor Spectroscopy, BTU Cottbus-Senftenberg, Cottbus, Germany — [2]Institute of Solid State Physics, University of Bremen, Bremen, Germany — [3]Department of Interface Science, Fritz-Haber Institute, Berlin, Germany

CeO_x-Cu inverse catalysts have been shown to convert CO_2 into valuable chemicals through catalytic hydrogenation. The catalytic activity may further be enhanced by alloying ceria with trivalent, catalytically active metals, such as Sm, promoting the formation of Ce^{3+} active sites. In this work, the structural and chemical properties of (111)- and (100)- oriented CeO_x islands alloyed with samarium were explored by low-energy electron microscopy and X-ray photoemission electron microscopy. After Sm deposition on the as-grown CeO_x islands, the near-surface region of (100)-oriented CeO_x is reduced after exposure to H_2 at 470 °C, whereas the deeper layers as well as the whole (111)-oriented islands retain the Ce^{4+} state. Subsequent reoxidation with O_2 leads to the complete Ce^{4+} state recovery, suggesting the healing of oxygen vacancies. Additional annealing at 470 °C induces samarium diffusion into the ceria matrix. Yet, subsequent exposure to H_2 reduces neither the (111)- nor the (100)-oriented $CeSmO_x$ islands, suggesting a quite unexpected stability of this system.

Part: O
Type: Poster
Topic: Heterogeneous catalysis
Email: flege@b-tu.de