Abstract

Title:	The preparation and study of catalytic system Cu(O)-CeO_2 using surface analytical methods
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Abstract:

This work is concerned with a study of copper/copper oxide – cerium dioxide systems and their interaction with CO and H_2O molecules. Investigated samples were prepared in the form of powder catalysts and also as very well defined model inverse systems. The low temperature CO oxidation powder catalysts were studied by means of XPS, XRD, SEM, TEM and in micro-reactor system allowing the CO oxidation examination. The study of H_2O adsorption and co-adsorption of H_2O with CO were carried out on model inverse systems CeO_x(111)/Cu(111) in ultra-high vacuum conditions using X-ray, synchrotron radiation (SRPES), resonant (RPES) photoelectron spectroscopies and LEED. It was observed on the stoichiometric surface water adsorbs molecularly at 120 K while on the reduced surface and surface of CeO_2 islands on Cu(111) the H_2O adsorption is partially dissociative with formation of OH groups. The increase of Ce^{3+} species (i.e. surface reduction) observed after H_2O adsorption was explained as an electronic effect of the Ce 4*f* charge accumulation and Ce 5*d* charge depletion. From the view point of low temperature CO oxidation over powder catalysts the best results were achieved on samples contained 8 wt. % of Cu. The smaller CeO_2 particle size is, the higher number of oxygen vacancies is on the surface and the higher catalytic activity of the catalysts can be reached. The presence of copper oxide is also important for the higher catalytic activity.

Keywords: cerium oxide, model and real catalysts, copper, copper oxides, adsorption, reaction, H_2O, CO, photoelectron spectroscopy, diffraction, electron microscopy, micro-reactor