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Composition-Dependent Size and Shape Changes of Pt-Rh Alloy Nanoparticles on α-Al_2O_3(0001) during CO Oxidation Reactions[1] UTA HEJRAL, PATRICK MUELLER, University of Siegen - Germany, OLIVIER BALMES, DIEGO PONTONI, European Synchrotron Radiation Facility (ESRF) - France, ANDREAS STIERLE, University of Siegen - Germany — Pt-Rh nanoparticles are widely used in chemical industry and in automotive exhaust control where they catalyze among other reactions the oxidation of CO. Major attention has in recent years been paid to the study of alloy nanoparticles with the aim to identify systems that allow to control the catalyst selectivity and to enhance its activity and lifetime [1]. Sintering is regarded as one of the major causes of catalyst deactivation and it is of utmost scientific and economic interest to find ways to prevent it. Here we present concentration-dependent size and shape changes of epitaxial Pt-Rh alloy nanoparticles on α-Al_2O_3(0001) substrates observed in-situ during CO oxidation at near atmospheric pressures. The experiments were carried out in a flow-reactor at the high energy beamline ID15A (ESRF) by means of grazing incidence x-ray diffraction (E=78.8 keV), x-ray reflectivity measurements and in-situ mass-spectrometry [2]. During the experiments the O_2 pressure ranged between 0 and 14 mbar while the temperature and CO pressure were kept at 550 K and 20 mbar, respectively. Our results demonstrate that a higher Rh concentration reduces sintering significantly.

[1] J.Y. Park et al., Nano Lett. 8 673 (2008)
[2] R. v. Rijn et al., Rev. Sci. Instr. 81 014101 (2010)

Uta Hejral
University of Siegen - Germany

[1]BMBF Project NanoXCat

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