

Synthesis, Structure, and Properties of Bimetallic Nanoparticles of Noble Metals

Kateryna Loza,¹ Alexander Rostek,¹ Oleg Prymak,¹ Marc Heggen,² and Matthias Eppel¹

¹Inorganic Chemistry and Center for Nanointegration Duisburg-Essen (CeNIDE), University of Duisburg-Essen, kateryna.loza@uni-due.de, Germany

²Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons, Forschungszentrum Jülich GmbH

Metal nanostructures attract particular interest because of their unique properties compared to their bulk counterparts. Especially noble metals are important, e.g. silver, gold, and platinum. Bimetallic nanoparticles offer a new degree of freedom to vary the particle characteristics by blending two metals in one particle. This opens up new possibilities due to their tunable properties, e.g. in heterogeneous catalysis, electrocatalysis, or imaging. The internal structure of nanoparticles strongly depends on the synthesis route and also on their surface functionalization. Due to the heterogeneity of different properties of individual components (crystal symmetry, redox potential, or surface charge), the successful mixture of these materials is challenging. We have prepared series of monodisperse nanoalloys over the entire composition range and analyzed their structure using a wide range of methods. X-ray diffraction as well as electron microscopic and spectroscopic techniques were employed to understand the structure of nanoparticles, since the distribution of the metals inside the nanoparticles affects their chemical, physical and crystallographic properties.