Silver Copper Nanoparticles for the Oxygen Reduction Reaction

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The co-sputtering of bimetallic nanoparticles opens up exciting new directions in the field of heterogeneous catalysis. In addition to precise control over nanoparticle size, composition, and loading, this vapor phase deposition technique could allow for the “freezing-in” of phases which are not thermodynamically stable in the bulk and which may have interesting properties beyond those of their parent materials. These nanoparticulate alloy phases are of interest to researchers in heterogenous catalysis, as they allow for more precisely tuned adsorbate binding energies than are offered by bulk phase materials. Alloying copper into silver nanoparticles, for example, has been predicted to enhance silver’s activity for the electrochemical oxygen reduction reaction (ORR). Here we demonstrate the ability to deposit size selected silver-copper nanoparticles across a full range of silver-copper compositions, and we show an enhancement in catalytic activity of the bimetallic nanoparticles for the ORR in base compared to pure silver. This enhancement is in line with catalytic results from bimetallic silver-copper thin films, which show significant changes in grazing incidence x-ray diffraction spectra after exposure to electrolyte. We intend to use future work at SSRL to further explore the surface of both the thin film and nanoparticulate catalysts *in situ* and to elucidate the mechanism of this improvement in catalytic activity.