Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Structural transformations in the physical mixture of Pd and Cu nanoparticles VINEETHA MUKUNDAN, Purdue University, JUN YIN, CHUAN-JIAN ZHONG, SUNY, Binghamton, OANA MALIS, Purdue University — Pd-Cu bimetallic nanoparticles have the potential to replace palladium, the second most active metal having important applications as a catalyst in fuel cell and hydrogen storage reactions. We investigated the temperature-induced transformations in physical mixtures of Pd and Cu nanoparticles, using in-situ real-time synchrotron based x-ray diffraction. These nanoparticle mixtures undergo coalescence and structural phase transformations at relatively low temperature, and sinter at higher temperature. They form alloys with ordered bcc (B2) structure at low temperature (300C). At higher temperature (450C), it transforms into a disordered fcc (alloy) structure. The structural parameters probed are size, phase, composition and morphology. Grain growth was modeled with growth laws proposed for nanocrystalline materials and the diffusion mechanism driving sintering was explored. The effect of elemental compositions, different substrates and annealing atmospheres on the evolution of the PdCu alloy nanoparticles was also explored.

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Date submitted: 14 Nov 2012 Electronic form version 1.4