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Synthesis and solid-state transformations of Cu core/Ni shell nanoparticles KARL UNRUH, MICHAEL LATTANZI, LAURA HIGGINS, University of Delaware, STEPHEN JOHNSON, Delaware State University, THOMAS EKIERT, University of Delaware — Air stable Cu core/Ni shell nanoparticles have been prepared in a two step polyol-type process by adding $CuCl_2{\cdot}2H_2O$ and NaOH to an ethylene glycol solution at 160 $^\circ$C followed by the subsequent addition of $NiCl_2{\cdot}6H_2O$ and NaOH at a solution temperature of 180 $^\circ$C. Allowing the low temperature step of the reaction to proceed to completion ensured that the high temperature step resulted in the formation of elemental Ni rather than a Cu-Ni alloy as verified from the near bulk values of the measured Cu and Ni lattice parameters. The solid-state transformation from the as-prepared core/shell structure to an essentially homogeneous Cu-Ni alloy has been studied by differential scanning calorimetry, x-ray diffraction, and vibrating sample magnetometry measurements. These measurements reveal that the core/shell structure remains largely intact to temperatures above 400 $^\circ$C during an annealing profile consisting of a 20 $^\circ$C/min temperature ramp followed by a rapid temperature quench.

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