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Thermogravimetric and Magnetic Studies of the Oxidation and Reduction Reaction of $SmCoO_3$ to Nanostructured Sm_2O_3 and Co BRIAN KELLY, Department of Physics and Astronomy, University of Delaware, RONALD CICHOCKI, Department of Chemistry and Biochemestry, University of Delaware, GERALD POIRIER, Advanced Materials Characterization Laboratory, University of Delaware, KARL UNRUH, Department of Physics and Astronomy, University of Delaware — The $SmCoO_3$ to nanostructured Sm_2O_3 and Co oxidation and reduction reaction has been studied by thermogravimetric analysis (TGA) measurements in forming gas (FG) and inert N_2 atmospheres, x-ray diffraction (XRD) and vibrating sample magnetometry (VSM). The TGA measurements showed two clearly resolvable reduction processes when heating in FG, from the initial $SmCoO_3$ phase through an intermediate nanostructured mixture of Sm_2O_3 and CoO when heated to 330C for several minutes, and then the conversion of CoO to metallic Co when heated above 500C. These phases were confirmed by XRD and VSM. Similar measurements in N_2 yielded little mass change below 900C and coupled reduction processes at higher temperatures. Isoconversional measurements of the CoO to Co reduction reaction in FG yielded activation energies above 2eV/atom in the nanostructured system. This value is several times larger than those reported in the literature or obtained by similar measurements of bulk mixtures of Sm_2O_3 and CoO, suggesting the nanostructuring was the source of the large increase in activation energy.

Brian Kelly
Department of Physics and Astronomy, University of Delaware

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