

Abstract Submitted
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Calciothermic Preparation of Sm-Co From Nanostructured Precursor Oxides¹ BRIAN KELLY, Department of Physics and Astronomy, University of Delaware, GERALD POIRIER, Princeton Institute for the Science and Technology of Materials, Princeton University, KARL UNRUH, Department of Physics and Astronomy, University of Delaware — A calciothermic reduction/diffusion process has been developed for the preparation of Sm-Co alloys with good magnetic properties using nanostructured Co- and SmCo-oxide powders as precursors. The precursor oxides were obtained from an aqueous solution of $\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$, $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, and citric acid which, after the removal of excess water, spontaneously reacts to form a fine mixture of Co_3O_4 and SmCoO_3 nanoparticles. These nanoparticles were then mixed with metallic Ca granules, sealed under inert gas in Nb tubes, and heated to temperatures between 850 and 1000 °C for various lengths of time. The products of the reduction/diffusion reaction were studied by scanning electron microscopy with elemental analysis, vibrating sample magnetometry, and x-ray diffraction. These measurements revealed that (in addition to the oxidation product CaO) the products of the reduction/diffusion process were micron-sized particles of essentially single phase SmCo_5 with a coercivity in excess of 40 kOe and a Curie temperature of about 950 °C.

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