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Unique Separation of Core-Shell Nanoparticle Components using Resonant X-Ray Scattering KATHRYN KRYCKA, JULIE BORCHERS, NIST Center for Neutron Research, JOSEP NOGUES, GERMAN SALAZAR-ALVAREZ, Institut Catala de Nanotecnologia, JORDI SORT, Universitat Autonoma de Barcelona — Nanoparticle-based devices, fluids, and biomedical applications are at the research forefront due to an unprecedented ability to control growth and uniformity. In particular, it is now possible to produce bulk quantities of monodisperse nanoparticles comprised of distinctive chemical layers. Characterizing these internal structures with conventional techniques such as TEM, however, remains a challenge. Here we demonstrate using Fe-oxide and Mn-oxide core-shell nanoparticles, that multiple-energy resonant small angle x-ray scattering (SAXS) can be effectively utilized to uniquely and unambiguously separate the scattering contributions from the Fe oxide and the Mn oxide regions without any *a priori* knowledge of the internal structure. This technique reveals that the nanoparticles have a monodispersity less than 10% and a total spherical radius of 4.3 nm that is divided into a distinctive Fe oxide core of radius 1.5 nm and a Mn oxide impregnated shell covering the outermost 2.8 nm. Although especially well suited for determining core-shell nanoparticle morphology, this novel approach is applicable for resolving the diffraction contributions from any layered system such as multilayered ultra-thin films.

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