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Characterization of Rare Earth Oxide/Gold Composites Synthesized by Control of Surface Composition ZANNATUL YASMIN, ROBERT DENNIS, DHIRAJ SARDAR, MAOGEN ZHANG, WALDEMAR GORSKI, KELLY NASH, University of Texas at San Antonio — The need for novel nanosized biosensors has resulted in increase interest in nanocomposites. The challenge in development of materials is that they should offer robust and tunable characteristics (fluorescence, magnetic, thermal behaviors, etc.) while remaining biocompatible. In this study, we use small molecules to attach transition metal nanostructures (gold spheres) to select rare earth oxide (Er^{3+}:Y_2O_3) particles synthesized by a urea precipitation method. The goal is to enhance the fluorescence of the rare earth materials through surface plasmons resonance generated by the gold structure while achieving dispersibility of the particles. The attachment of gold nanoparticles (Au NPs, $\sim$20 nm) to the surface of rare earth nanoparticles (RENPs, $\sim$100 nm) is achieved by the surface modification with (3-Mercaptopropyl) trimethoxy-silane (MPTS); the average numbers of Au NPs per RENP is controlled by the composition of MPTS and Propyltrimethoxysilane (PTMS, without functional groups). Characterization of the physical properties is performed by Fourier transform infrared spectroscopy and scanning electron microscopy. Fluorescence spectroscopy is used to compare the radiative decay rates of nanocomposites to unmodified particles. The resulting structures will be used in studies of bulk and particle polymer composites for potential biosensing and drug delivery applications.

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