

# SYNTHESIS AND SPECTROSCOPY OF LANTHANIDE ION-DOPED COLLOIDAL NANOPARTICLES

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Over the past decade, significant strides have been made in the study of luminescent materials. Synthesis techniques were developed capable of producing luminescent materials with nanometer particle sizes. With the advent of these novel techniques able to prepare nanoparticles, a resurgence in the research of lanthanide doped materials was born. Lanthanide doped nanoparticles have been extensively investigated both from an academic and commercial standpoint. Researchers are interested in the fundamental differences in the luminescence properties of these nanomaterials versus the already established bulk or microcrystalline particles. Furthermore,  $\text{Ln}^{3+}$ -doped nanoparticles hold tremendous potential in a number of areas. They are attractive for the display and imaging industry for such applications as improved phosphors and 3D imaging display, where it has been shown that screen resolution has an inverse relationship with phosphor size. The field of medical diagnostics has also kept a keen eye on the development of lanthanide doped nanocrystals. They are ideal for use as luminescent probes in immunoassays, for example.

Lanthanide ion containing compounds have long found commercial uses due to their sharp, intensely luminescent  $f - f$  electronic transitions. Standard uses include phosphors in fluorescent lamps and display devices. However, contemporary technology has necessitated the need for more efficient phosphors but having at the same time, smaller particle sizes. A wealth of literature is available on  $\text{Ln}^{3+}$ -doped nanoparticles synthesized via various techniques ranging from the very simple to the extravagant. However, most of these luminescence studies were carried on nanopowders. For certain applications, including using nanoparticles as bio-labels, a colloidal solution containing the nanoparticles is of the essence.

In this paper, we report on the preliminary synthesis of oxide and fluoride colloidal nanoparticles doped with various  $\text{Ln}^{3+}$  ions synthesized via diverse wet chemical techniques. Furthermore, results of the luminescence studies carried on the lanthanide doped colloids are reported.