

Luminescence optimization of $Gd_2O_3:Ho/Yb$ upconversion nanophosphor for application to emissive pearl pigment

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As the global economy grows, the anti-counterfeiting technologies have received great attention. Introducing security inks, holograms, and unique markers to the product to distinguish it from counterfeiting is a typical approach. Upconversion(UC) nanophosphor, converting infrared light into visible light, can be used as a security material. In this work, $Gd_2O_3:Ho/Yb$ nanoparticles were synthesized by spray pyrolysis, and the upconversion characteristics were optimized by controlling the activator concentration and introducing monovalent alkali ions and applied to prepare green emissive pearl pigments. In terms of achieving high upconversion emission and preparing nano-sized particles, the content of monovalent alkali ion was optimized. Finally, the resulting $Gd_2O_3:Ho/Yb$ powder had a size of less than 200 nm and high green emission enough to identify the emission with a naked eye. The synthesized $Gd_2O_3:Ho/Yb$ nanoparticles were coated on the surface of pearl pigments and confirmed to have good emission under 980 nm IR irradiation without significant loss of pearl properties.