Abstract

With the development of nanotechnology, the inorganic luminescence materials have attracted increasing attention for its great potential for bio-application. Among them, the rare-earth doped up-conversion nanoparticles take the advantages of improved signal-to-noise ratio, increased tissue penetration, reduced photo-bleaching and reduced photo-toxicity as well as the use of inexpensive 980 NIR laser as the pumping source. Here, the monodispersed CaF$_2$:Yb,Er upconversion nanoparticles (particle size \(\sim 5.4 \text{ nm} \pm 0.9 \text{ nm}\)) were synthesised using thermolysis of precursors in oleylamine. An undoped CaF$_2$ shell was subsequently deposited on the doped core nanoparticles. The core/shell upconversion nanoparticles remained monodispersed (particle size \(\sim 6.9 \text{ nm} \pm 1.2 \text{ nm}\)). Compared to the core nanoparticles, the core/shell nanoparticles showed a ~11 times increase of total emission intensity and a ~30 times increase in red emission intensity. CaF$_2$:Yb,Er/CaF$_2$ Core/shell up-conversion nanoparticles showing strong red emission, with longer wavelength and penetration distance compared to that of shorter wavelengths of green and blue lights, may find promising potentials in bio-applications.

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