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Visible and near infrared upconversion emission from Tm^{3+}, Yb^{3+} doped SrF_2 nanoparticles

M Ghorashi[1], H R Madaah-Hoseini[2], and E Mohajerani[3]

1. Institute for Nanoscience and Nanotechnology, Sharif University of Technology, Tehran, Iran
2. Department of Materials Science and Engineering, Sharif University of Technology, Tehran, Iran
3. Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran

E-mail: ghorashi@mehr.sharif.ir

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Abstract

Tm^{3+}, Yb^{3+}-codoped SrF_2 nanoparticles were synthesized through a facile hydrothermal technique. Citrate ions were introduced as the capping agent into the reaction. Upconversion nanoparticles were characterized by field emission scanning electron microscopy (FESEM), Energy dispersive x-ray spectroscopy (EDS), x-ray diffraction (XRD), Dynamic light scattering (DLS), Zeta potential, Fourier transform Infrared spectroscopy (Ft-IR), and the 980 nm laser induced photoluminescence spectroscopy. Rare-earth ions (Na^+), which are the cations of citrate salts, are incorporated into the structure to act as charge compensators. Upconversion emission in the visible and NIR region was observed by the 980 nm irradiation. Nanoparticles with a narrow size distribution and a uniform morphology were directly dispersible in water, forming a quite transparent suspension. Nanoparticles size was approximately 10 nm. High penetration of the Near-Infrared light into the body tissue makes these nanoparticles appropriate for tumor targeting in the deeper tissues for the purpose of bioimaging and photodynamic therapy.

Keywords: upconversion nanoparticles, strontium fluoride, Tm and Yb dopants, hydrothermal synthesis, optical properties

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