Temperature sensing and optical heating behaviour in Er^{3+}/Yb^{3+} doped $SrMoO_4$ upconversion nanophosphor

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A series of Er^{3+}-Yb^{3+} doped $SrMoO_4$ phosphors were synthesized via hydrothermal method with varying Er^{3+} and Yb^{3+} concentrations. The crystal structure, phase purity and morphology of the samples were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and Field emission scanning electron microscopy (FESEM). The XRD result shows that material exhibits pure tetragonal phase structure. Under 980 nm laser light excitation, $SrMoO_4$: Er^{3+}/Yb^{3+} reflects strong green UC emission bands at 530 nm and 552 nm, which are due to the $^2H_{11/2}\rightarrow{}^4I_{15/2}$ and $^4S_{3/2}\rightarrow{}^4I_{15/2}$ transitions, respectively and a weak red emission band at 656 nm due to $^4F_{9/2}\rightarrow{}^4I_{15/2}$ transitions of Er^{3+} ion. By using fluorescence intensity ratio (FIR) technique, temperature sensing and optical heating behaviour were investigated. The maximum sensitivity was found to be $11.21\text{x}10^{-3}$ K^{-1} at 500 K. The heat induced in the sample by laser irradiation was measured and the maximum temperature of the sample particles was calculated as 420 K at 65 W/cm^2. The result indicates that the present material could be suitable for high temperature thermometry studies.

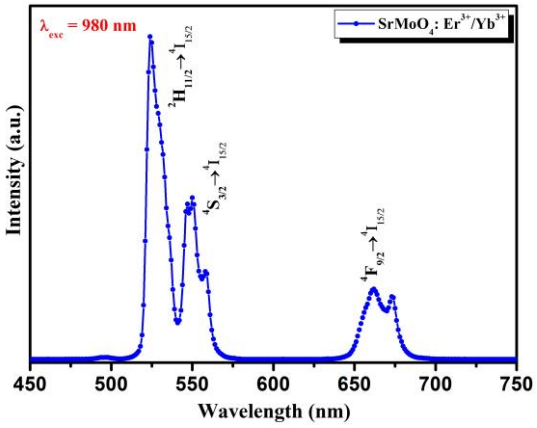

Fig. 1. Upconversion emission spectra of $SrMoO_4$: Er^{3+}/Yb^{3+} phosphor under 980 nm excitation.

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