

Up-conversion photoluminescence of BaTiO₃ doped with Er³⁺ under excitation at 1500 nm

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© 2016 Elsevier Ltd The structural and up-conversion properties of Er³⁺ doped BaTiO₃ phases have been studied. All phases were synthesized using the sol-gel process. X-ray powder diffraction (PXRD), Raman spectra, scanning electron microscopy (SEM), absorption spectra, photoluminescence spectra (PL) and decay curves were used to characterize the resulting phosphors. The results of PXRD indicate the existence of solid solution for all phases, in which the Er³⁺ cations effectively replace the Ti⁴⁺ sites at low concentrations and both sites Ba²⁺ and Ti⁴⁺ at high concentrations. When exciting with 1500 nm laser radiation, the spectra are dominated by a strong emission band at 980 nm ($4I_{11/2} \rightarrow 4I_{15/2}$) and a weak red emission at 660 nm ($4F_9/2 \rightarrow 4I_{15/2}$). In order to understand the mechanism of the infrared-to visible up-conversion process, the decay curves of the emission at 980 nm by exciting at 1500 nm and 800 nm were analyzed; these results show that the process is in good agreement with a