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

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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 (4I11/2 → 4I15/2) and a weak red emission at 660 nm (4F9/2 → 4I15/2). 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