Luminescence and Upconversion Process in Er^{3+}:ZrO_2 Nanocrystalline Samples

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Pure and Erbium doped nanocrystalline zirconium oxide was prepared by the Sol-Gel method and the photoluminescence (PL) characterization was performed. The upconversion luminescence of the erbium doped samples is observed under 1.43μm and 0.96μm OPO laser excitation. The experimental results shows the generation of UV-Blue (378-407 nm), green (500-560 nm), red (655750 nm) and IR (910-970 nm) radiation, see Fig. 1. The main mechanism that allows for upconversion appears to be energy transfer among Er^{3+} ion in excited state [1]. The pumping wavelength, ion concentration dependence, and the life times of the observed upconversion emission were measured and compared with the ones reported for other hosts [2-4]. Beside the upconversion results here presented, the excellent chemical and photochemical stability of monoclinic zirconium oxide as well as its low phonon energy suggest a large potential of this material for a number of applications such as active optical windows, new generation television screen and as phosphorus material [5].

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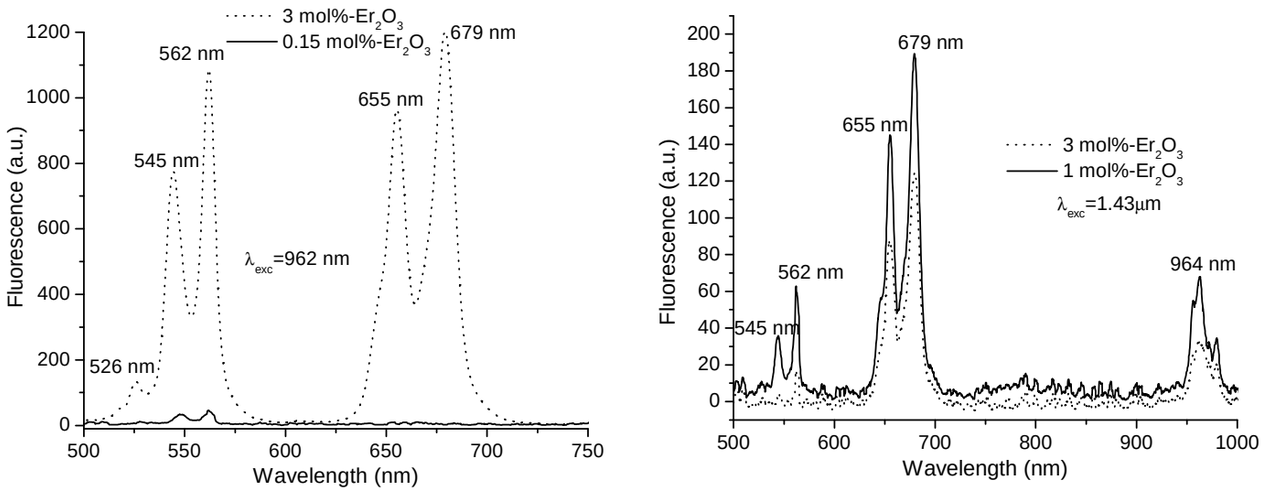

Fig. 1 Upconverted fluorescence of Er^{3+} in nanocrystalline ZrO_2:Er^{3+}. The pumping wavelength and ion concentration dependence is observed.