Structural modification, and magnetic properties enhancement with Er3+, of sol-gel TiO2 thin films.

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Abstract: Nano-crystalline undoped and erbium doped TiO2 thin films, were dip-coated on glass substrates by sol-gel method. The films were annealed at 450 °C during 1 hour. DSC results show that the crystallization effectuates at 339°C for undoped TiO2, whereas for erbium doped TiO2 the crystallization occurs earlier with two separated exothermic. XRD diagrams illustrate that undoped and erbium doped TiO2 crystallize in anatase phase only and indicate that the crystallite size decreases from 24 to 21 nm as a function of the increase in Er3+ content. This result is confirmed by Raman spectra. Moreover, the VSM results indicate, on one hand, a ferromagnetic behaviour of the undoped TiO2. On the other hand, the incorporation of Erbium leads to an enhancement of the ferromagnetic behaviour. It is worthy to mention that the weak Er3+ doping (0.1 at.%) is the high ordered magnetically with highest saturation magnetization of 1.92 memu. Both elaborated TiO2 and Er:TiO2 films show good structural properties and have a diluted magnetic semiconductors structure. The films are promising for the possible applications in optoelectronic devices.

Keywords: TiO2 doped Er3+, Structural properties, sol-gel, Magnetic Properties, oxygen vacancies