Structural modification and magnetic properties enhancement with Er^{3+}, of sol-gel TiO_2 thin films

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Abstract : Nano-crystalline un-doped and erbium doped TiO_2 thin ?lms 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 un-doped TiO_2, whereas for erbium doped TiO_2 the crystallization occurs earlier with two separated exothermic. XRD diagrams illustrate that un-doped and erbium doped TiO_2 crystallize in anatase phase only and indicate that the crystallite size decreases from 24 to 21 nm as a function of the increase in Er^{3+} content. This result is confirmed by Raman spectra. Moreover, the VSM results indicate, on one hand, a ferromagnetic behaviour of the un-doped TiO_2. On the other hand, the incorporation of Erbium leads to an enhancement of the ferromagnetic behaviour. It is worthy to mention that the weak Er^{3+} doping (0.1 at.%) is the high ordered magnetically with highest saturation magnetization of 1.92 memu. Both elaborated TiO_2 and Er:TiO_2 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.