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Synthesis and optical properties of TiO_2-based magnetic nanocomposites

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Abstract

Magnetic titania nanoparticles covered/embedded in SiO_2 shell/matrix were simultaneously manufactured by the single-step laser pyrolysis. The present study is a continuation of our previous investigations on the TiO_2/Fe and TiO_2/HMDSO (hexamethyldisiloxane) derived-systems. The aim of this work is to study the synthesis by IR (Infrared) laser pyrolysis of magnetic TiO_2 based nanocomposites which implies many concurrent processes induced in the gas phase by the laser radiation. The dependence between characteristic properties and the synthesis parameters was determined by many analytical and complementary methods: XRD (X-ray diffraction) structural analysis, UV-Vis (Ultraviolet-visible) and EDAX (Energy-dispersive X-ray) spectroscopy, TEM and HRTEM (Transmission Electron Microscopy at low and high resolution) analysis and magnetic measurements. The results of analysis indicate the presence of disordered silica, Fe, α-Fe_2O_3 and mixtures of anatase and rutile phases with mean crystallite dimensions (in the 14-34 nm range) with typical character of diluted magnetic oxide systems and a lower bandgap energy (Eg= 1.85eV) as compared with TiO_2 P25 Degussa sample.

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