# Nanosized Fe3O4 incorporated on a TiO2 surface for the enhanced photocatalytic degradation of organic pollutants

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In this work, precipitation and sol-gel mixed procedures were used to prepare a TiO2@Fe3O4 nanocomposite. The X-ray diffraction (XRD)and selected area electron diffraction (SAED)results unmistakably elucidated the tetragonal structure of TiO2 with the cubic structure of Fe3O4. The particle size, interface, and surface area were determined by transmission electron microscopy (TEM)and Brunauer-Emmett-Teller (BET)measurements. The TEM image of the prepared TiO2@Fe3O4 clearly showed that the material is nano-spherical in shape. The BET surface area of the nanocomposite was measured to have a higher value (115.7 m2/g)than those of the TiO2 (65.2 m/g)and Fe3O4 (30.1 m2/g)pure systems because of the synergistic effect and interface between the two different oxides. The absorption edges of the TiO2@Fe3O4 nanocomposites were studied with the UV-abs spectrometer, and the results revealed that the material band gap is 2.70 eV. The chemical composition and dispersion of the nanocomposite system was assessed via energy dispersive X-ray spectroscopy (EDS)along with elemental mapping. The PL spectra of the prepared nanocomposite system indicated a delay of the electron-hole recombination process due to the presence of Fe3O4, thus inducing intermediate states into the TiO2 system. The favourable optical properties of the developed nanocomposites were exploited for the photocatalytic degradation of colourful dyes, such as methylene blue, and methyl orange, as well as of colourless phenol. In addition, their stability and photocatalytic mechanism are explained in detail.