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Investigation the Photocatalytic Properties of Fe3O4-TiO2 Nanocomposites Prepared by Sonochemical Method

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Abstract : Fe3O4 is one of the important magnetic oxides with spinel structure; it has exhibited unique electric and magnetic properties based on the electron transfer between Fe2+ and Fe3+ in the octahedral sites. Fe3O4 has received considerable attention in various areas such as cancer therapy, drug targeting, enzyme immobilization catalysis, magnetic cell separation, magnetic refrigeration systems and super-paramagnetic materials Fe3O4–TiO2 nanostructures were synthesized by simple, effective and new co-precipitation method assisted by ultrasonic reaction at room temperatures with organic surfactant. The effect of various parameters such as temperature, time, and power on the size and morphology of the product was investigated. Alternating gradient force magnetometer shows that Fe3O4 nanoparticles exhibit super-paramagnetic behaviour at room temperature. For preparation of nanocomposite, 1 g of TiO2 nanostructures were dispersed in 100 mL of ethanol. 0.25 g of Fe(NO3)2 and 2 mL of octanoic acid was added to the solution as a surfactant. Then, NaOH solution (1.5 M) was slowly added into the solution until the pH of the mixture was 7–8. After complete precipitation, the solution placed under the ultrasonic irradiation for 30 min. The product was centrifuged, washed with distilled water and dried in an oven at 100 °C for 3 h. The resulting red powder was calcinated at 800 °C for 3 h to remove any organic residue. The photocatalytic behaviour of Fe3O4–TiO2 nanoparticles was evaluated using the degradation of a Methyl Violet (MV) aqueous solution under ultraviolet light irradiation. As time increased, more and more MV was adsorbed on the nanoparticles catalyst, until the absorption peak vanish. The MV concentration decreased rapidly with increasing UV-irradiation time

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