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Fabrication of an Eco-Friendly, Stable Chitosan Capped Fe_2O_3- CeO_2 Nano Composite and its Photocatalytic Activity under Visible Light

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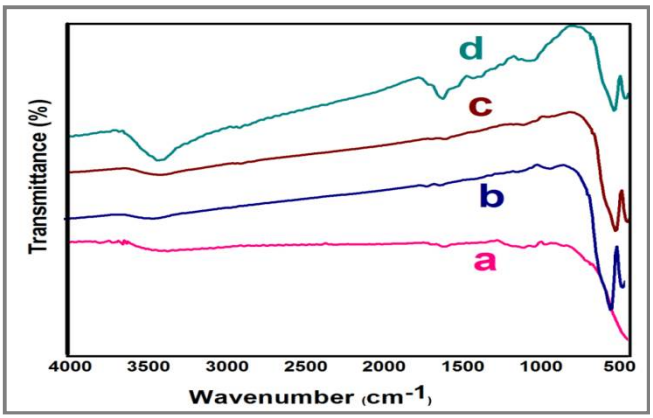
ABSTRACT

Chit-Fe_2O_3-CeO_2nanocompositewas fabricated by the two-step process. The microstructure, purity, morphology, and spectroscopic properties of the resultant samples were fairly characterized using XRD, EDX, SEM, TEM, FT-IR and UV-Vis DRS techniques. Photocatalytic activity of the prepared samples was investigated by the photodegradation of pollutants (Rhodamine B and 4-Chloro Phenol) under visible-light irradiation. The photocatalytic experiments exposed that the ternary Chit-Fe_2O_3-CeO_2nanocomposite has an enhanced activity than the binary and pure photocatalysts. Based on the obtained results, the highly enhanced activity was attributed to the synergistic effect between metal oxides and the support of the biopolymer. The kinetics of the photodegradation, possible mechanisms, COD and active species trapping experiments were also examined. The reuse and stability analysis validated the stability of the ternary photocatalyst.

Graphical Abstract



FT-IR Spectrum of (a) CeO_2, (b) Fe_2O_3, (c) CeO_2 -Fe_2O_3, and(d) Chit-Fe_2O_3-CeO_2.

Keywords: Chit-Fe_2O_3-CeO_2, Nanocomposite, Visible-light-driven photocatalyst.