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Cobalt photodeposition on Fe_3O_4/TiO_2 as a novel magnetically separable visible-light-driven photocatalyst for efficient degradation of 2,4-dichlorophenol

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ABSTRACT

In this work, we deposited different amounts of cobalt on Fe_3O_4/TiO_2 nanocomposite (FTC samples) via photodeposition method. X-ray diffraction (XRD), energy dispersive X-ray spectroscopy (EDX), field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), diffuse reflectance spectroscopy (DRS), N_2 physisorption and the vibration sample magnetometry (VSM) were used to characterize these nanocomposites. Photocatalytic activity of the samples was examined via degradation of 2,4-dichlorophenol (2,4-DCP) under visible light. We obtained 30.42% and 57.84% degradation of 2,4-DCP after 180 min irradiation in the presence of pure TiO_2 and ternary nanocomposite containing 2.92 wt% cobalt (FTC (2.92)), respectively. The higher photocatalytic performance of FTC samples can be attributed to the high specific surface areas and the enhancing visible light absorption by cobalt. Our synthesized nanophotocatalysts can act as a novel visible light-driven and magnetically recyclable photocatalyst for environmental application.

Keywords: Cobalt; TiO_2; Fe_3O_4; Photodeposition; 2,4-dichlorophenol

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