Characterization of newly synthesized ZrFe2O5 nanomaterial and investigations of its tremendous photocatalytic properties under visible light irradiation

Abstract

High functional ZrFe2O5 nanoparticles were synthesized using coprecipitation technique. The chemical composition of nanomaterials was studied by energy-dispersive X-ray (EDX). To observe the morphology, field emission scanning electron microscopy (FE-SEM) was used. X-ray diffraction (XRD) technique was utilized to appraise the structure of the synthesized material. The photocatalytic behavior of ZrFe2O5 nano-particles was investigated by measuring the degradation rate of toluidine blue O (TBO) dye in aqueous solution in the presence of ZrFe 2O5 nano-particles under visible light irradiation. A steady decrease in absorption peak under visible light irradiation was observed by increasing exposure time. The degradation efficiency was observed as 92% after 140 min of exposure to visible light. Besides, ZrFe2O5 nanophotocatalyst could be recovered and recycled easily. The rate of TBO and total organic carbon (TOC) removal under visible light irradiation decreased by only 5% and 10%, respectively, after seven cycles of use, demonstrating the high photostability of the synthesized nano-photocatalyst material.

Keyword: Coprecipitation technique; Degradation efficiency; Energy dispersive x-ray; Field emission scanning electron microscopy; Photocatalytic behaviors; Photocatalytic property; Synthesized materials; Visible-light irradiation.