Synthesis and characterization of rice straw/Fe3O4 nanocomposites by a quick precipitation method

Abstract

Small sized magnetite iron oxide nanoparticles (Fe3O4-NPs) with were successfully synthesized on the surface of rice straw using the quick precipitation method in the absence of any heat treatment. Ferric chloride (FeCl3·6H2O), ferrous chloride (FeCl2·4H2O), sodium hydroxide (NaOH) and urea (CH4N2O) were used as Fe3O4-NPs precursors, reducing agent and stabilizer, respectively. The rice straw fibers were dispersed in deionized water, and then urea was added to the suspension, after that ferric and ferrous chloride were added to this mixture and stirred. After the absorption of iron ions on the surface layer of the fibers, the ions were reduced with NaOH by a quick precipitation method. The reaction was carried out under N2 gas. The mean diameter and standard deviation of metal oxide NPs synthesized in rice straw/Fe3O4 nanocomposites (NCs) were 9.93 ± 2.42 nm. The prepared rice straw/Fe3O4-NCS were characterized using powder X-ray diffraction (PXRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM), energy dispersive X-ray fluorescence (EDXF) and Fourier transforms infrared spectroscopy (FT–IR). The rice straw/Fe3O4-NCs prepared by this method have magnetic properties.

Keyword: Iron oxide; Nanocomposites; Rice straw; Transmission electron microscopy; X-ray powder diffraction