Abstract

CeO_2-SiO_2 and Fe/CeO_2-SiO_2 nanocomposites were synthesized by using SB3-18 surfactant. The methods adopted for the synthesis of nanocomposites were sol-gel followed by hydrothermal method. SiO_2 nanoparticles were extracted from rice husk. The precursors used for CeO_2 and Fe were cerium chloride heptahydrate ($CeCl_3.7H_2O$) and iron chloride hexahydrate ($FeCl_3.6H_2O$). The nanocomposites were characterized by Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy- Energy dispersive X-ray analysis (SEM-EDX), thermogravimetric analysis (TGA), UV-Vis spectrometery and powder X-ray diffraction (XRD) analysis. FTIR results confirmed the presence of functional groups, SEM results showed that the nanocomposite has irregular symmetry, EDX results showed the percentage of Fe, Ce, O and Si was 2.27, 67.41, 21.90 and 10.69%. The bandgap of CeO_2-SiO_2 nanocomposites was 2.73 and 4.73eV while bandgap of Fe/CeO_2-SiO_2 nanocomposites was 5.2 and 5.7eV. XRD results confirmed the synthesis of Fe/CeO_2-SiO_2 nanocomposites and the particle size calculated by Williamson-Hall equation was 5.26nm with specific surface area of 645.54m^2/g. These results showed that as the particle size decreases, specific surface area increases. Fe/CeO_2-SiO_2 nanocomposites was used as catalyst in one-pot synthesis of 2,4,5-triphenyl-1H-imidazole, in development of latent fingerprints by powder dusting method and in degradation of methylene blue by column filtration. Results showed that Fe/CeO_2-SiO_2 nanocomposites have excellent catalytic and degradation activity. Nanocomposites were also found very excellent for the development of latent fingerprints.