

Copper oxide nanoparticles-loaded zeolite and its characteristics and antibacterial activities

ABSTRACT

In the present work, a simple and green co-precipitation method was used to prepare copper oxide-zeolite nanocomposites (CuO-zeolite NCs). The weight ratio (1, 3, 5, 8 and 10 wt%) of CuO nanoparticles (NPs) loaded into zeolite was investigated to obtain the optimum CuO distribution for antibacterial activities. The prepared CuO-zeolite NCs were characterized by ultraviolet-visible (UV-vis) spectroscopy, Fourier transform infrared (FT-IR) spectroscopy, powder X-ray diffraction (XRD), and energy dispersive X-ray fluorescence spectrometry (EDXRF). The transmission electron microscopy (TEM) and field emission scanning electron microscopy (FE-SEM) revealed a uniform surface morphology of the CuO-zeolite NCs. The UV-vis spectrum of NCs showed absorption peaks between 230 and 280 nm for nano-CuO in the XRD patterns, and new peaks appeared between (36.56° – 38.83°) related to the CuO. At weight ratio less than 10 wt%, the CuO nanoparticles loaded to the zeolite exhibited spherical shapes with average particle diameter of 6.5 nm measured by TEM and XRD. Antibacterial activities were tested against Gram-negative and Gram-positive bacteria. The obtained results showed that, CuO-zeolite NCs with 8 wt% CuO nanoparticles had the highest antibacterial activities against *Bacillus Subtilis* B29 and *Salmonella Choleraesuis* ATCC 10708, which can be attributed to the good dispersion of CuO NPs on the zeolite surface.

Keyword: Copper oxide-zeolite; Nanocomposites; Antibacterial