Abstract

In this research, some nanostructures having the general formula of Cu-MO_x consisting Cu-SnO_2, Cu-ZnO and Cu-Ni were synthesized via hydrothermal method. (M) indicates the type of metal and (x) represents the number of oxygen in the nanostructure. The nanostructures were synthesized using copper (II) chloride and metal salts in aqueous solution, in the presence of cetyl trimethyl ammonium bromide surfactant and hydrazine hydrate (as redusing agent) at 120°C for 12-18 h in an autoclave reactor. To investigate the effect of the surfactant on the size distribution of nanostructures, Cu-SnO_2 nanostructure was synthesized with different amounts of surfactant. The Synthesized nanostructures were characterized by X-ray diffraction (XRD) analysis, Fourier transform infrared (FT-IR) spectroscopy, Field emission scanning electron microscopy (FESEM), Transmission electron microscopy (TEM) and Energy-dispersive X-ray spectroscopy (EDS). Morphology and the size distribution of the nanostructures were assigned by Scanning electron microscopy and Transmission electron microscopy images. The X-ray diffraction results were confirmed the existence of these nanostructures and also estimated their crystals size. Infrared spectra were shown strong absorption band in the area of 600-650 cm^{-1} for Sn-O-Sn vibrations in Cu-SnO_2 nanostructure, and also the absorption band in the area 550-650 cm^{-1} for Zn-O bond in Cu-ZnO nanostructure. Energy-dispersive X-ray spectroscopy analysis confirmed the elements in the nanostructures. Finally biological activity of the synthesized nanostructures was investigated. The inhibitory effect of nanostructures was assigned against Gram-positive bacteria (*Staphylococcus aureus, Bacillus cereus, Rhodococcus equi, Listeria monocytogenes*) and Gram-negative bacteria (*Pasteurella multocida, Proteus mirabilis*) using 96 sect plate dilution method to determine the minimum inhibitory concentration, and the diameter of inhibition was obtained. The results were showed that Cu-SnO_2 nanostructure had more inhibitory effect against the bacteria.The net effect of these nanostructures was studied on the rat liver tissue lipid peroxidation and malondialdehyde, which indicated the amount of lipid peroxidation and liver aminotransferases as the most sensitive and most widely used diagnostic enzymes in the potential mechanisms of injury.

Keywords: nanostructure, hydrothermal, surfactant, antibacterial activity, lipid peroxidation

University of Zabol
Graduate School
Faculty of Science
Department of Chemistry

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Characterization and biological activity of Cu-MO_x nanostructures synthesized by hydrothermal method

Supervisers:
Dr. Alireza Samzadeh Kermani
Dr. Mohammadreza Hajinezhad

Advisers:
Dr. Mohsen Najimi
Dr. Hamid Beizaei

By:
Malihe Honarshenas

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