Green chemistry for the synthesis of Ag2S/RHA-MCM-41 nanocomposite and study of its spectroscopic and antimicrobial propertise

Seyyedeh Leila Jafari*,

Rice husk (RH) is a major agricultural waste which can be used as a fuel, and the combustion product, ash, is also considered as a waste product. Recently, it has been reported that ca. 70 million tons of rice husk ash was produced yearly worldwide. RH and its ash have attracted great interest in terms of the extraction of the SiO2 component, which can act as a cost-effective source for the synthesis of some important catalysts/supports such as zeolites and mesoporous silica. Mesoporous material MCM-41, a member of the M41S family, was first synthesized by the scientists of Mobil Oil in 1992. MCM-41 has attracted considerable interest for possible applications in many fields as diverse as catalysis, drug delivery, adsorption, sensors, and optics due to its high surface area, low mass densities, well-defined and adjustable pore structure. Other promising applications are the use of MCM-41 as hosts for semiconducting and ferroelectric nanomaterials. Ag2S belong to the group of semiconductors. Ag2S has a direct band gap of 0.92 eV with wide application in optical and electronic devices such as photovoltaic cells, photoconductors and infrared detectors. In this study, the spherical structure of Ag2S nanoparticles was synthesized in the RHA-MCM-41 matrix. The samples were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Transmission electron microscopy (TEM), and Scanning electron microscopy (SEM). TEM images show small spherical nanoparticles belong to Ag2S nanoparticles with mean diameter 14 nm. The zone diameters of Ag2S/RHA-MCM-41 nanocomposite are 9 mm for Gram-negative (E. coli) and Gram-positive (S. aureus) bacteria.

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