Fabrication and antibacterial performance of Ag-Au nanoparticles decorated ionic liquid modified magnetic core-analcime shell microspheres

Mohsen Padervand[a*], Manouchehr Vossoughi[a,b]

[a] Institute for Biotechnology and Environment (IBE), Sharif University of Technology

[b] Department of Chemical Engineering and Petroleum, Sharif University of Technology

Corresponding author: Dr. Mohsen Padervand, Email: mohsenpadervand@gmail.com

Azadi Ave., Tehran, Iran, P.O.Box 11365-9516, Fax:+98-2166029165, Tel:+98-2166163643

Abstract

After silica coating of the prepared nickel ferrite nanoparticles, a micrometric layer of zeolitic material (analcime) was grown on the surface. To make the composites good host, surface modification was done with [BMIM]PF_6 ionic liquid. Finally, the samples became antibacterial agents via loading the Ag and Au nanoparticles and denoted as X@IL/A/S/NF (X= Ag or Au). All the samples were well characterized by Fourier Transform Infrared spectroscopy (FTIR), Vibrating Sample Magnetometer (VSM), X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Energy Dispersive X-ray (EDX), and N_2 adsorption-desorption isotherms (BET) analysis methods. Antibacterial activity of the prepared samples was investigated by inactivating E.coli and S.aureus as the gram negative and gram positive bacterium, respectively. According to the TEM images of cell walls after the treatment time, the antibacterial behavior was discussed. Releasing of noble metal ions from the zeolitic pores make the microorganisms inactive. Moreover, the Minimum Inhibitory Concentration (MIC) was studied and the results

showed that the presence of ionic liquid on the surface has an important role to increase the antibacterial activity.

Keywords: Composites, Zeolite, Ionic liquid, Noble metal, Bacteria