

STUDY ON SYNTHESIS OF SILVER NANOPARTICLE DECORATED ZSM-5/MCM-41 MULTIPOROUS COMPOSITE AND ITS ANTI-BACTERIA

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Background and Aims: Silver itself is known as one of the most interesting antibacterial materials. It is generally believed Ag⁺ can bind to bacterial cell wall membrane (slightly negative), damage it and so alter its functionality. In this report we investigate the preparation of ZSM-5/MCM-41 multiporous composite containing silver (Ag-MC-Z5) and the influence of silver concentration on disinfection capability of Ag-MC-Z5 nano-antibacterial material.

Methods: Silver nanoparticle decorated ZSM-5/MCM-41 multiporous composite has been prepared by using ion-exchange method with change of Ag concentration: 0.1; 0.3; 0.5; 0.7; 0.9 wt%. Formation of Ag nanoparticles, size and shape of Ag-MC-Z5 nano-antibacterial material were determined by X-Ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The antibacterial activity of silver nanoparticles against E. coli was investigated as a model for Gram-negative bacteria.

Results: The results showed the presence of spherical nanosized Ag particles about 3 nm – 4 nm. By the initial Ag concentration of nanosized materials were at least 0.5 wt%, it is noted that growth inhibition rates against E. coli was 100 % as the initial concentration of E. coli was 1.5×10^5 CFU/ml and contact time was 10 minutes.

Conclusions: Ag-MC-Z5 nano-antibacterial material has been successfully prepared. E. coli antibacterial activity of Ag-MC-Z5 nano-antibacterial material was better than that of the other materials containing silver such as silver - charcoal, Ag-TiO₂.

Keywords: ZSM-5/MCM-41 multiporous composite, silver, nano-antibacterial material, E. Coli, ion-exchange.