Synthesis of silver nanoparticles in montmorillonite and their antibacterial behavior.

Abstract

Silver nanoparticles (Ag NPs) were synthesized by the chemical reducing method in the external and interlamellar space of montmorillonite (MMT) as a solid support at room temperature. AgNO(3) and NaBH(4) were used as a silver precursor and reducing agent, respectively. The most favorable experimental conditions for synthesizing Ag NPs in the MMT are described in terms of the initial concentration of AgNO(3). The interlamellar space limits changed little (d-spacing = 1.24-1.47 nm); therefore, Ag NPs formed on the MMT suspension with d-average = 4.19-8.53 nm diameter. The Ag/MMT nanocomposites (NCs), formed from AgNO(3)/MMT suspension, were characterizations with different instruments, for example UV-visible, PXRD, TEM, SEM, EDXRF, FT-IR, and ICP-OES analyzer. The antibacterial activity of different sizes of Ag NPs in MMT were investigated against Gram-positive, ie, Staphylococcus aureus and methicillin-resistant S. aureus (MRSA) and Gram-negative bacteria, ie, Escherichia coli, Escherichia coli O157:H7, and Klebsiella pneumoniae, by the disk diffusion method using Mueller-Hinton agar (MHA). The smaller Ag NPs were found to have significantly higher antibacterial activity. These results showed that Ag NPs can be used as effective growth inhibitors in different biological systems, making them applicable to medical applications.

Keyword: Silver nanoparticles; Nanoparticles; Montmorillonite; Antibacterial activity; Mueller-Hinton agar.