

Abstract

Nanocomposites are synthetic or naturally occurring solid materials created by combining two or more different constituent materials, each with its own important physical or chemical qualities, to form a new substance with enhanced properties. PVA/Ag nanocomposites are currently in great demand for a variety of industrial applications due to their improved thermal, optical, electrical, and antibacterial properties.

In this work, Ag-NPs have been synthesized by using rapid method (microwave-assisted method), studying the effect of the microwave power on Ag-NPs properties like optical such as energy bandgap, electrical, product yield and then used to enhance the properties of PVA films such as electrical, thermal, and antibacterial properties. It was found that the power affected size, increasing power leads to an increase in size and a decrease in the energy band gap from 2.93eV to 2.55eV. As for the product yield, 22.11% of the Ag-NPs which is not significantly change by power changes, The synthesized Ag-NPs showed a broad spectrum of antibacterial activities toward different Gram-positive and Gram-negative bacteria strains, The decrease in power lead to a decrease in the Ag-NPs' size , inducing an increase in their ability to penetrate the cell membrane, improving antibacterial activity for Ag-NPs. Ag/PVA nanocomposite film caused high colony forming unit reduction from 36 to 6 with a reduction percent of 84 %for the E. coli bacteria. Different volume of Ag-NPs that were prepared at medium- low power and combined with PVA polymer to give Ag/PVA nanocomposite film. The UV-Vis absorption of Ag/PVA nanocomposite film increases with increasing Ag-NPs had with a slight effect on the band gap, resulted from the distribution of the particles within the PVA film. Also, the electrical conductivity of PVA film increases from 0.065 S/m to 0.57 S/m with increasing the amount of Ag-NPs added to the film, the degree of crystallinity of PVA film increases from 14.047% to 18.331% with increasing the wt% of Ag-NPs added to the film.

