ABSTRACT

The Ag_3PO_4/SiO_2 material is one of the composite materials with potential as an antibacterial agent because it has the ability to inhibit bacterial growth through interaction between silver ions and microbial cell walls. However, the uneven distribution of Ag_3PO_4 particles and limited interaction between the active component and the supporting material can affect its antibacterial effectiveness. Silika (SiO_2) chosen as a supporting material because it has a high surface area, good chemical stability, and can disperse active particles. To enhance the ability to bind Ag^+ ions to the silica surface, modification was performed using 3-aminopropyltriethoxysilane (APTES), which introduces amine groups ($-NH_2$) as active sites for binding metal ions.

In this study, the Ag_3PO_4/SiO_2 material was synthesised using the sol-gel and in-situ precipitation methods with varying concentrations of APTES as the surface functionalisation agent. The presence of the amine groups from APTES is expected to increase the number of Ag^+ ions immobilised on the silica surface and produce a more uniform distribution of Ag_3PO_4 particles. These characteristics have the potential to increase the effectiveness of the antibacterial activity of the resulting material.

The antibacterial activity of the modified Ag_3PO_4/SiO_2 was evaluated against the Gram-negative bacterium Escherichia coli and the Gram-positive bacterium Staphylococcus aureus using the disc diffusion method. The effectiveness of inhibiting bacterial growth is analysed based on the diameter of the inhibition zone formed around the test disc. By measuring the inhibition zones, this study aims to systematically evaluate the influence of APTES concentration variation on the antibacterial activity of Ag_3PO_4/SiO_2. The results of the study are expected to provide insight into the role of APTES functionalisation in enhancing the antibacterial activity of Ag_3PO_4/SiO_2 composite material against Escherichia coli and Staphylococcus aureus.

***Keywords**: Ag_3PO_4/SiO_2, APTES, surface functionalisation, antibacterial activity, inhibition zone*