MODIFICATION OF GRAPHENE OXIDE MORPHOLOGY AND ITS FUNCTIONALIZATION AS A TRANSPARENT ANTIBACTERIAL COATING

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ABSTRACT

This study was intended to examine the effect of morphological modification of graphene oxide (GO) and its functionalization on polyacrylamide (PAM), GO, and clove essential oil (CO) [PAM/GO/CO] nanocomposites with CO variations. This research is using experimental method. The experiment started with the preparation of GO using the Hummers method. The GO obtained was characterized using ultraviolet-visible (UV-Vis) spectroscopy, Fourier transform infrared (FTIR) spectroscopy, and scanning electron microscope (SEM). Next, the PAM/GO solution was prepared and then mixed with CO with various volumes of CO to obtain PAM/GO/CO nanocomposites. PAM/GO/CO nanocomposites were characterized using UV-Vis spectroscopy, FTIR, and SEM. The PAM/GO/CO nanocomposite was then tested for antibacterial properties against *S. aureus* and *E. coli* bacteria. This research resulted in GO powder and PAM/GO/CO nanocomposite solution, both of which were black in color. The results of the UV-Vis test for GO produced two absorbance peaks at wavelengths of 230 nm and 300 nm, which indicated the presence of GO material. The FTIR test showed the presence of hydroxyl groups (OH), CO_2, C = C, and C – H. The fungal groups OH and C = C indicated the presence of GO according to the results of the UV-Vis test. SEM test for GO showed the presence of multilayer and flake GO. UV-Vis test results for PAM/GO/CO nanocomposites showed two absorbance peaks. The first peak is in the UV region and shifts towards a longer wavelength with increasing CO volume. Meanwhile, the second peak is at a fixed wavelength, which is 300 nm. The larger the volume of CE, the higher the absorbance of the nanocomposite. FTIR test results for PAM/GO/CO nanocomposites showed OH and C = C functional groups. SEM test results for PAM/GO/CO nanocomposites showed GO agglomeration. Finally, the antibacterial test results showed an increase in the inhibition zone of PAM/GO/CO nanocomposites, both against *S. aureus* and *E. coli* bacteria, with increasing CO volume. However, PAM/GO/CO nanocomposites were more effective as antibacterial against gram-negative bacteria than gram-positive bacteria.

Kata Kunci: *GO, PAM, CO, PAM/GO/CO nanocomposite, antibacterial, S. aureus, E. coli*