

# Optimization of Nanocomposite Polyacrylamide/Graphene Oxide/Clove Essential Oil for Anti-bacterial Coating

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## ABSTRACT

The objectives of this research were i) to synthesize graphene oxide (GO) using the Hummers method; ii) to synthesize nanocomposite of polyacrylamide/graphene oxide/clove essential oil (PAM/GO/CE) with variation of GO compositions; iii) to characterize GO and PAM/GO/CE nanocomposites based on UV-Vis and FTIR spectroscopies; and iv) to determine the antibacterial property of the resulting nanocomposite against *S. aureus* and *E. coli* bacteria. In general, the experiments in this research begin with the preparation of GO using the Hummers method. Furthermore, various characterizations of GO were carried out using UV-Vis and FTIR spectroscopies. Then, the PAM/GO/CE solution was synthesized with variation of the GO compositions. Finally, the anti-bacterial test of GO and PAM/GO/CE was carried out against *S. aureus* and *E. coli* bacteria. In this study, GO was successfully prepared and the PAM/GO/CE nanocomposites were also produced with variations in GO composition of 5 mg, 15 mg, 45 mg, and 100 mg. The UV-Vis test results showed two peaks for GO, namely at wavelengths of 230 nm and 300 nm. Meanwhile, the UV-Vis test of PAM/GO/CE nanocomposites also produced two peaks indicating GO and CE components. The results of FT-IR characterization for GO showed various transmittance bands indicating functional groups of C = C, CO<sub>2</sub>, C - H, and -OH. The FT-IR characterization for PAM/GO/CE nanocomposite showed a profile that was not much different from that of GO. This shows the GO component dominates the resulting nanocomposite. Finally, the antibacterial property against *S. aureus* and *E. coli* bacteria can be enhanced by the presence of PAM/GO/CE nanocomposites. GO had inhibition zone diameters of 11 mm and 12 mm against *S. aureus* and *E. coli* bacteria. The diameters of the inhibition zone increased to 12 mm and 14 mm, respectively, for PAM/GO/CE nanocomposites.

Kata Kunci: PAM, GO, CE, PAM/GO/CE, *S. aureus*, *E. coli*