

Physical, Mechanical and Electrical Properties of Chitosan/Graphene Oxide Composite Films for Copper Ions (Cu²⁺) Detection

Abstract

Copper ions are one of the metal ions that contribute significantly to water pollution and threaten the ecosystem. The threat heightened the importance of the detection and removal of the contaminants. In this study, the Chitosan/Graphene Oxide (CH/GO) composite film was synthesized at different GO ratios via a direct casting technique. The structural, mechanical and film adsorption capacities were characterized along with the electrical properties. The results revealed that adding GO into CH at a 1:5 ratio produces the highest strength and adsorption capacity. The 1:5 film was then tested for its electrical properties to see the possibility of utilizing it as part of an electrical measurement system. Various electrical parameters such as permittivity (ϵ' , ϵ''), $\tan \delta$, bulk resistivity (R_b) and DC conductivity (σ_{DC}) were studied. Results show that the 1:5 ratio chitosan film in various Cu²⁺ concentrations yielded significant differences in electrical properties. The R_b and σ_{DC} gave the most significant results and can be used as Cu²⁺ detection parameters. © 2023, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature.

Keywords

Chitosan; Copper detection; Graphene oxide; Impedance spectroscopy; Polymer