

CHARACTERIZATION OF rGO-INCORPORATED POLYVINYL ALCOHOL (PVA) AND POLYETHYLENE OXIDE (PEO) POLYMER COMPOSITES FOR PACKAGING APPLICATIONS

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Polyvinyl alcohol (PVA) and polyethylene oxide (PEO) are widely used in packaging applications due to their flexibility, non-toxicity and relatively low cost. These polymers can be utilised in anti-static packaging applications, given that their electrical conductivity is enhanced. The electrical conductivity of these polymers can be improved by the addition of reduced graphene oxide (rGO). rGO is a derivative of graphene oxide (GO), which exhibits higher electrical conductivity, mechanical strength and hydrophobic behaviour. This project focused on facile and low-cost synthesis of rGO/polymer composites and studying their electrical and mechanical properties. The synthesis of rGO was carried out using the modified Hummers' method, which was confirmed using Raman spectroscopy. Four different composites with different amounts of rGO (0, 0.5, 1, and 1.5 wt%), were prepared for each polymer using a solution processing method, followed by drying at 60 °C for PEO and 80 °C for PVA. According to the volume conductivity measurements obtained using the potentiostat, both PVA and PEO composites showed maximum conductivities of 1.01×10^{-7} and 8.33×10^{-8} S/m, respectively, at 1.5wt% of rGO. Structural studies revealed that PEO composites have higher Young's moduli compared to their PVA counterparts, while the highest Young's modulus was obtained for rGO/PEO 1.5 wt% composite. Additionally, PEO composites demonstrated higher tensile strength than PVA composites. However, both polymer composites exhibited a reduction in strength when exposed to moisture, leading to a loss of mechanical strength. The electrical conductivities and mechanical properties of both polymers were improved with the addition of rGO.

Keywords: Electrical conductivity, Mechanical strength, Polyethylene oxide, Polyvinyl chloride, Reduced graphene oxide