THE EFFECT OF FILLER FROM RICE HUSK ASH ON MG30-MAGNESIUM TRIFLATE POLYMER ELECTROLYTES

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ABSTRACT

THE EFFECT OF FILLER FROM RICE HUSK ASH ON MG30-MAGNESIUM TRIFLATE POLYMER ELECTROLYTES

Over the years, researchers worldwide have focused on polymer electrolytes (PEs) for electrochemical devices. This study focuses on exploring the effect of adding rice husk ash (RHA) as a filler with 30% poly (methyl methacrylate) grafted natural rubber (MG30)-magnesium triflate ($Mg(OTf)_2$) based composite polymer electrolytes (CPEs). Rice husk ash (RHA) was selected as the filler because it is a low-cost, renewable material with potential to improve the properties of polymer electrolytes (PEs). The composite polymer electrolytes (CPEs) were prepared using the solution casting method, where MG30 mixed with magnesium triflate, ($Mg(OTf)_2$) salt and different concentration of RHA. The aim was to evaluate the structural and mechanical effects of RHA on polymer matrix at different concentrations (2-10 wt.%). The films were analyzed using Fourier transform infrared spectroscopy (FTIR), optical microscopy (OM) and tensile test. FTIR analysis revealed clear interactions between the polymer matrix, magnesium triflate salt, and RHA, indicating successful incorporation and strong molecular interactions. OM shows a relatively smooth and homogeneous surface morphology for the 6 wt.% RHA sample, indicating uniform filler dispersion and minimal agglomeration. This homogeneous distribution contributes to improved ion transport pathways and consistent mechanical properties. Tensile testing verified that 6 wt.% RHA offered the best possible compromise between flexibility and mechanical strength. It showed excellent mechanical reinforcement without sacrificing flexibility, achieving a high tensile stress of 0.7 MPa and an exceptional elongation at break of almost 374%. In conclusion, the results indicate that 6 wt.% RHA provides the optimal performance to enhance the mechanical and structural properties of the polymer electrolyte. This finding suggests that using agricultural waste like RHA as a filler can help improve polymer electrolytes (PEs) in a more environmentally friendly way. Overall, this research offers a sustainable approach to enhance the performance of composite polymer electrolytes (CPEs) for potential applications in energy storage devices.

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