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

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ABSTRACT

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

Energy storage devices are widely used in various electronic and industrial applications. However, they often face several critical challenges that compromise their safety and performance. Common issues include high flammability, electrolyte leakage, dendrite formation during charge-discharge cycles, and insufficient mechanical support. Additionally, these devices are generally unsuitable for long-term use due to thermal instability and material degradation, posing potential safety risks to users. To address these limitations, composite polymer electrolytes (CPEs) have emerged as a promising solution. In this study, CPEs were developed by incorporating silica (SiO_2), extracted from rice husk ash (RHA), into a polymer matrix consisting of 30 wt. % poly(methyl methacrylate)-grafted natural rubber (MG30) and calcium triflate ($Ca(OTf)_2$) as the dopant salt. Various concentrations of SiO_2 (2 wt. %, 4 wt. %, 6 wt. %, 8 wt. %, and 10 wt. %) were examined to determine the effect of filler content on the electrolyte properties. The samples were fabricated using the solution casting method combined with a simple precipitation technique. Structural, morphological, and mechanical properties were characterized using fourier transform infrared spectroscopy (FTIR), optical microscopy (OM), and tensile testing. Among the samples, the CPE containing 8 wt. % SiO_2 demonstrated the strongest molecular interactions and effective bonding between MG30, the salt, and the silica filler. Although OM analysis showed a somewhat non-uniform surface at this concentration, the sample exhibited the highest tensile strength (~1.2 MPa) and a notable elongation at break (~370%). Therefore, the 8 wt. % SiO_2 CPE showed superior performance and holds significant potential for safer and more efficient energy storage devices.

TABLE OF CONTENTS