CHARACTERIZATIONS OF TAMARIND SEED POLYSACCHARIDE (TSP)/CARRAGEENAN BLEND FOR POLYMER ELECTROLYTES

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This Final Year Project Report entitled **"Characterizations of Tamarind Seed Polysaccharide (TSP)/Carrageenan Blend for Polymer Electrolytes**" was submitted by Effa Arisya binti Suhaimi in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Applied Chemistry, in the Faculty of Applied Sciences, and was approved by

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ABSTRACT

CHARACTERIZATION OF TAMARIND SEED POLYSACCHARIDE (TSP)/CARRAGEENAN BLEND FOR POLYMER ELECTROLYTES

Polymer electrolyte (PE) from natural polymers such as tamarind seed polysaccharide (TSP) are widely studied as it is safer than liquid electrolyte that is known as harmful. However, the brittleness of TSP films due to hydrogen bonding creates a problem that could limit their practical application. Thus, in this study, the TSP was blended with carrageenan at various ratios (0:100, 20:80, 40:60, 60:40, 80:20, and 100:0), using solvent casting technique, to address the brittleness issue. The optimal polymer blend ratio was then ascertained through an analysis of the system's mechanical, electrical, morphological, and structural characteristics. At 40:60 (TSP40), TSP/carrageenan successfully achieved increased flexibility as observed in the rise of tensile strain to 4.3223%. This was verified by the TSP/carrageenan interaction, which prevents hydrogen bonds from forming between individual polymer chains, as confirmed by FTIR analysis. The increase in flexibility also contributed to the improvement in TSP 40's conductivity to 1.78×10^{-8} S cm^{-1}. The morphological examinations of TSP40 shows improvement with the decrease in the congested structure. The addition of 15wt% of MgTf to a blend system led to a significant change. The ionic conductivity was increased to 4.48×10^{-6} S cm^{-1} with MgTf doping. The boost of the ionic conductivity was due to the presence of the conducting species from MgTf. Also, the easy movement of the ions was contributed by the presence of more possible coordinating sites and amorphous phase of the blend system. FTIR analysis verified the interaction between the polymer's oxygen atoms and the salt's Mg^{2+} ions. Additionally, the enhanced morphology of the TSP40 film was also observed. The natural polymers of TSP and carrageenan used in this study were biodegradable, making them a more sustainable option. This has been in line with the Sustainable Development Goals 7 (SDG7) of clean and affordable energy and 12th Shared Prosperity Vision 2030 (KEGA12) of green economy.

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