SOLID POLYMER ELECTROLYTE BASED ON

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FACULTY OF SCIENCE AND TECHNOLOGY

UNIVERSITI MALAYSIA TERENGGANU

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SOLID POLYMER ELECTROLYTE BASED ON SAGO DOPED AMMONIUM BROMIDE: CONDUCTIVITY AND FTIR STUDY

By

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DECLARATION

I hereby declare that this thesis entitled SOLID POLYMER ELECTROLYTE BASED ON SAGO DOPED AMMONIUM BROMIDE : CONDUCTIVITY AND FTIR STUDY is the result of my own research expect as cited in the references.

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ABSTRACT

The study of biopolymer electrolyte has attracted many researchers to involve into the conductivity exploration cellulose as polymer electrolyte. The sago doped ammonium bromide thin film has been prepared in order to investigate the potential of sago as solid polymer electrolyte of the conductivity for these films. These solid polymer electrolytes were prepared by solution cast technique and analyzed by Electrochemical Impedance Spectroscopy (EIS), Fourier Transform Infrared Spectroscopy (FTIR) and Transference Number Measurement (TNM). In the EIS analysis, the highest ionic conductivity of this solid polymer electrolyte at room temperature was observed to be 6.90×10^{-9} Scm^{-1} for sample with 15wt. % concentration of Ammonium Bromide (AB). The temperature dependence conductivity shows that it follows the Arrhenius rule where $R^2 \sim 1$. The FTIR spectra shows that the intensity of peak at 1020 cm^{-1} change with increase wt. % of ammonium salt. This peak is due to C-O stretching of C-O-C group in the anhydroglucose ring which is from polysaccharide structure in the sago. The peak at 2940 cm^{-1} was increase in intensity due to increase of AB concentration indicates that some interactions occurred between sago and AB. The Transference Number Measurement (TNM) studies were conducted to determine and correlate the ionic diffusion phenomena with the conductivity behavior of Sago-AB. The conductivity values were found to be directly proportional and controlled by the ionic mobility and ionic diffusion coefficient. It also shows that these polymers are proton conductors.

POLIMER ELEKTROLIT PEPEJAL MERUJUK KEPADA SAGU DI DOPAN AMMONIUM BROMIDA: KAJIAN KEKONDUKSIAN DAN FTIR

ABSTRAK

Kajian terhadap biopolimer elektrolit telah menarik minat ramai penyelidik melibatkan diri di dalam kajian mengenai kekonduksian selulose sebagai polimer elektrolit. Kajian terhadap polimer elektrolit pepejal berdasarkan sagu yang telah didopkan ammoium bromida berjaya dihasilkan adalah bagi mendapatkan kekonduksian tertinggi pepejal filem nipis tersebut. Polimer elektrolit pepejal itu telah disediakan dengan kaedah teknik tebaran larutan dan telah dianalisa dengan Spektroskopi Impidans Elektrolit, Spektroskopi Fourier Inframerah (FTIR) dan Pengukuran Nombor Pemindahan (TNM). Di dalam EIS analisis, nilai tertinggi ionik kekonduksian polimer elektrolit pepejal ini di ruang suhu bilik adalah 6.90×10^{-9} Scm^{-1} pada sampel 15wt. % kepekatan AB. Kebergantungan konduktiviti terhadap suhu menunjukkan ianya mematuhi Hukum Arrhenius. Analisis FTIR menunjukkan kedalaman puncak pada 1020 cm^{-1} berubah bergantung kepada peningkatan garam ammonium bromida. Ini menunjukkan kerana ada regangan ikatan C-O daripada kumpulan C-O-C di dalam rantai anhidrogukosa yang mana ia datang dari struktur polysakarida di dalam sagu. Puncak 2940 cm^{-1} bertambah pada kedalamannya disebabkan oleh pertambahan kepekatan AB menunjukkan ada sesuatu interaksi antara sagu dan AB. Ini menunjukkan pertambahan kedalaman puncak dengan pertambahan kepekatan garam dan didapati ada bertambahnya kedalaman denagan bertambahnya kepekatan garam. Pengukuran Nombor Pemindahan (TNM) telah dijalankan untuk mengenalpasti dan mengaitkan hubungan di antara fenomena difusi ionik dengan kekonduksian elektrolit Sagu-AB. Nilai-nilai kekonduksian didapati berkadar terus dan dimanipulasi oleh kebolehgerakan ion dan pekali difusi. Ia juga menunjukkan polimer ini adalah konduktor proton.