EFFECT OF RARE EARTH METAL OXIDES (Dy_2O_3, Er_2O_3, Yb_2O_3) ON PROPERTIES OF CELLULOSE BASED COMPOSITE POLYMER ELECTROLYTE

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Final Year Project Report Submitted in Partial Fulfilment of the Requirements for the Degree of Bachelor of Science (Hons.) Chemistry in the Faculty of Applied Sciences Universiti Teknologi MARA

JULY 2019

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

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The objectives of this study are to fabricate CMC – LiTFSI SPE and to measure the effect of rare earth metal oxides on properties of SPE. Solution casting method were used where CMC as polymer host and LiTFSI were combined to form SPE and three types of rare earth metal which are Dy_2O_3, Er_2O_3 and Yb_2O_3 were added as filler. The SPE film samples were characterized using Electrochemical Impedance Spectroscopy (EIS), Fourier Transform Infrared (FTIR) Spectroscopy, X-Ray Diffractometer (XRD) and Tensile. For the EIS analysis, the addition of LiTFSI increased the ionic conductivity of CMC from 9.14×10^{-8} Scm^{-1} to 2.91×10^{-7} Scm^{-1}, but incorporation of rare earth metal to CMC-LiTFSI decreased the ionic conductivity. The FTIR spectra shows the complexation of Li^+ with all electron donor atoms in CMC structure and there was a shifting of O-H peak after the addition of LiTFSI, but after the addition of rare earth metal, the O-H peaks shifts to lower wavenumber. XRD results show that addition of LiTFSI reduces the peak intensity which indicates the polymer system becomes more amorphous while the addition of rare earth metal increases the crystalline peak. These XRD results supported the EIS results, ion transport is faster in amorphous phase thus increase the ionic conductivity. For the analysis of Tensile, the addition of LiTFSI salt increase the tensile strength while the addition of rare earth metal decrease the tensile strength due to the disturbance intermolecular interaction to the polymer matrix. In conclusion, the addition of rare earth metal decreased the ionic conductivity and reduced the mechanical properties of CMC-based SPE.