THE EFFECT OF SiO_2 AS FILLER IN PMMA/ENR 50/$LiCF_3SO_3$ ELECTROLYTE

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ABSTRACT

THE EFFECT OF SILICON DIOXIDE (SiO_2) AS FILLER IN POLY(METHYL METHACRYLATE) (PMMA)/50% EPOXIDISED NATURAL RUBBER (ENR 50)/LITHIUM TRIFLATE ($LiCF_3SO_3$) ELECTROLYTE

A freestanding film was obtained from Poly(methyl methacrylate) (PMMA)/50% epoxidised natural rubber (ENR 50)/lithium triflate ($LiCF_3SO_3$) blend by casting method. It was found that the addition of 0.1 g of SiO_2 filler improved the dispersion of ENR 50 in the blend system. This has been confirmed from its optical micrograph. This amount of SiO_2 filler also help in the dissociation of lithium triflate $LiCF_3SO_3$ salt in the blend system. It was found that this fillerized PMMA/ENR 50 blend contained the highest concentration of free triflate anion which was confirmed from its FTIR spectrum. The highest ionic conductivity achieved was 10^{-8} S/cm at room temperature. When higher amount of filler was added into the blend, it was found that the ionic conductivity of the blend decreased due to the congestion that occurred in the system as a result of excessive dissociation of salt. These were confirmed from their respective FTIR spectra and optical micrographs.

CHAPTER 1

INTRODUCTION

1.1 Polymer electrolytes background

To date, liquid-based electrolyte batteries are still the main choices because they exhibit high energy density and longer charge retention characteristic. However, the problems related to leakage of toxic liquid electrolytes and incompatibility with the lithium metal anodes still remain unsolved. To overcome these problems, solid electrolytes are the alternative. It exhibits several advantages over liquid electrolytes, such as no more leakage of toxic electrolytes and can be widely used in electrochemical power devices and power source (Zhou and Fang, 2007).

There are many types of solid electrolyte systems, including solid crystalline electrolytes, glass electrolytes and polymeric electrolytes. Amongst them, polymer electrolytes have received much attention due to their ability to be fabricated into thin flexible film, has a wide range of electrical properties and good mechanical strength (Ahmad, 2009). Polymer electrolytes can be defined as