THE EFFECT OF SALT CONCENTRATION IN FILLER MODIFIED PMMA/ENR 50/$LiCF_3SO_3$ ELECTROLYTE

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TABLE OF CONTENTS

ABSTRACT

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A freestanding film was obtained from poly(methylmetacrylate), PMMA/50% epoxidised natural rubber, ENR 50 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. The addition of filler also increased the amount of salt that could be dissolved in the PMMA blend. It was found that the maximum amount of salt that can be accommodated into the system was 0.3 g. Blend containing this amount of salt exhibited the highest ionic conductivity of 10^{-7} S cm^{-1} at room temperature. From its optical micrograph, it showed the most smooth surface which assist the transportation of lithium ion in the polymer blend matrix. It also showed the highest intensity of $\upsilon(SO_3)$ band indicating the presence highest number of free triflate anion. When more than 0.3 g of salt was added into the blend, the overall system became congested with excessive lithium salt which reduced the ionic conductivity of the system.

CHAPTER 1

INTRODUCTION

1.1 Polymer electrolytes background

To date, liquid-based electrolytes batteries are still the main choices because they exhibit high energy density and longer charge retention characteristics. However, 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. They 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 had received much attention due to its 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