PREPARATION AND CHARACTERIZATION OF LITHIUM ION CONDUCTING ELECTROLYTE BASED ON EPOXY NATURAL RUBBER FOR ELECTROCHEMICAL SYSTEM

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ABSTRACT

PREPARATION AND CHARACTERIZATION OF LITHIUM ION CONDUCTING ELECTROLYTE BASED ON EPOXY NATURAL RUBBER FOR ELECTROCHEMICAL SYSTEM

In this study, epoxy natural rubber (ENR 50) containing different concentration of lithium triflate ($LiCF_3SO_3$) salt were prepared using a solution cast technique. The optimum percentage of salt and plasticizer that gave the highest value of electrical conductivity of the sample was determined. Impedance spectroscopy technique was carried out in order to determine the electrical conductivity value. The highest conductivity value was 1.98×10^{-5} Scm^{-1} for 1 g ENR 50 at 35 wt % lithium triflate at 303 K. This conductivity was calculated using the bulk resistance value which can be obtained from the complex impedance plot in frequency range between 100 Hz and 1 MHz. The same procedure was repeated in order to prepare a plasticized samples with propylene carbonate (PC) using the optimum concentration of salted sample. The highest conductivity was 4.92×10^{-4} Scm^{-1} at 10 wt % PC. Finally, the highest conducting plasticized sample was then used as an electrolyte in fabrication of lithium-air cell. The capacity obtained was 1260 $mAhg^{-1}$ which containing of 0.0238 g manganese active materials.

CHAPTER 1

INTRODUCTION

1.1 Background

Polymer can be defined as a compound consisting of a large number of repeating units, called monomers. The large number of molecules, which is formed from the repetition of small and simple chemical units called monomer linked together by covalent bonds. Polymer salt complexes that exhibit a good electrical conductivity are useful for the development of electrochemical devices. The electrical conductivity in polymer salt complexes is due to the mobility of the conducting species contributed by the inorganic salt which dissociated into ions.

Polymers are normally insulators but become ionic conductors when injected with some inorganic salts. The polymer serves as an immobile solvent to these salts and the salts are dissociated in them. The ability of polymer to allow ions to move in their matrix is known as polymer electrolytes. Polymer electrolytes can be broadly classified into three groups which are dry polymer electrolytes, gel electrolytes and composite polymer electrolytes. Good polymer electrolytes should possess high ionic conductivity and poor electronic conductivity. The advantage of polymer electrolytes is ease of preparation into thin films of desirable sizes.