PREPARATIONS AND CHARACTERIZATIONS OF CELLULOSE-BASED COMPOSITE POLYMER ELECTROLYTES FOR LITHIUM-AIR BATTERIES

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ABSTRACT

PREPARATIONS AND CHARACTERIZATIONS CELLULOSE-BASED COMPOSITE POLYMER ELECTROLYTES FOR LITHIUM-AIR BATTERIES

In this study, the liquid electrolytes containing different concentration of lithium triflate ($LiCF_3SO_3$) salt were prepared. Impedance spectroscopy technique was carried out in frequency range between 100Hz to 1MHz .The optimum electrical conductivity obtained was 3.99×10^{-3} Scm^{-1} at 0.4M of lithium triflate. This conductivity value was calculated using the bulk resistance value which was obtained from the complex impedance plot. Various weight percentage (wt.%) of cellulose acetate were then added into liquid electrolytes (LE) to obtained the polymer gel electrolytes (PGEs).The highest conductivity of PGE was 5.99×10^{-3} Scm^{-1} at 6.0 wt.% of cellulose acetate (CA). Then, various wt.% of SiO_2 were further added to increase the viscosity of the PGEs. The highest conductivity of CPE was 4.25×10^{-3} Scm^{-1} at 3.0 wt.% of SiO_2. Finally, the highest conducting CPE sample was then used as an electrolyte in fabrication of lithium-air cell. The discharging capacity of lithium-air battery obtained was 4.25 mAh.

CHAPTER 1

INTRODUCTION

1.1 Background

Polymer can be defined as a class of material that is made up of a large number of molecules, which is formed from the repetition of small and simple chemical call monomer linked together by covalent bonds. Basically, polymer is insulator or unable to conduct electricity. Ionic conducting is useful in electrochemical devices such as lithium rechargeable batteries, fuel cells and electrochromic devices. Polymers will become ionic conductor when ionic salts dissolved on it and also known as polymer electrolytes. The ionic conduction is due to mobile anionic on cationic ions that act as the conducting species (Mohamed et al, 2000). In polymer electrolytes system, function of polymer is as an immobile solvent for the ionic salt. The good characteristics of polymer electrolytes are ionic conductors and electronic insulators. Polymer electrolytes can be classified into three groups that are dry polymer electrolytes, gel polymer electrolytes and composite polymers electrolytes. In addition, polymers electrolytes have a many advantages which are ease of preparation, flexibility, no-leakage of electrolyte, higher energy density, flexible geometry, improved safety hazards an enhance high ionic conductivity when adding plasticizer or filler. However, the main drawbacks of these polymer electrolytes are the low ionic conductivity at ambient