ALKALINE POLYMER BATTERIES: ELECTROLYTES PREPARATION AND BATTERY CHARACTERIZATION

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ABSTRACT

ALKALINE POLYMER BATTERIES: ELECTROLYTES PREPARATION AND BATTERY CHARACTERIZATION

In this study, polymer electrolytes consist of methyl cellulose (MC) and different wt% of potassium hydroxide (KOH) 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 of unplasticized sample was 5.64×10^{-6} S/cm for MC-KOH (70:30). Meanwhile, the highest conductivity for plasticized sample was 3.58×10^{-3} S/cm for MC-KOH-EC (46.67:20:33.33). These conductivities were calculated using the bulk resistance value obtained from the impedance plot in frequency range between 100 Hz and 1 MHz. For application in the battery system, the highest conducting of plasticized sample was used as the electrolyte. The battery was evaluated using the open-circuit voltage (OCV) and charge-discharge characteristics.

CHAPTER 1

INTRODUCTION

1.1 Background

Solid polymer electrolytes (SPE) have been extensively studied for application in electrochemical devices like cellular phone, laptop computer and thin credit cards (Yang et al. 2005). Solid polymer electrolyte is promising enhancement of lithium-battery technology with respect to the liquid or gel-like electrolytes in safety guarantee, non-leakage and flexible fabrication (Wang et al. 2008). In the case of alkaline electrolytes, compared to the aqueous solution, it can improve the safety, reability and processibility of these batteries (Zhu et al. 2004). Aqueous electrolyte faces the problem when handling and packaging the devices. These batteries have to be tightly sealed in order to prevent from the leakage of corrosive alkaline solution and this brings difficulties in geometrical design and minimization of batteries (Zhu et al. 2004). The basic advantage of using SPE systems successfully while replacing normal liquid electrolytes has aroused more interest. This is because it can lead to flexible, compact, laminated solid-state structures, no leakage, low self discharge in batteries, relax elasticity under stress condition, available in different geometries as well as easy processing and continuous production.

Alkaline polymer electrolytes have several characteristic such as easy to prepare, low cost, abundance their basic components and high ionic conductivity