Gel Polymer Electrolytes base on Cellulose Acetate for Lithium Batteries

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ABSTRACT

GEL POLYMER ELECTROLYTES BASE ON CELLULOSE ACETATE FOR LITHIUM BATTERIES

The electrolyte conductivity and electrochemical stability are key parameters in selecting suitable electrolyte in order to fabricate lithium battery. Cellulose acetate (CA) was used as the polymer, SiO_2 as the filler and $LiBF_4$ was dissolved in 20ml DMF as lithium salt and solvent respectively. Gel electrolytes with various concentrations of $LiBF_4$ and various weight percentages of CA and SiO_2 have been prepared. The conductivity was studied using complex impedance spectroscopy to investigate ionic conductivities in DMF-$LiBF_4$, DMF-$LiBF_4$-CA and DMF-$LiBF_4$-CA-SiO_2 electrolyte systems. The highest conductivity was found at 9.0M $LiBF_4$ in the DMF-$LiBF_4$ systems with conductivity of $(8.01X10^{-3} \pm 0.00)$ Scm^{-1}. In the DMF-$LiBF_4$-CA system with composition of 2 wt. % CA exhibited the highest conductivity of $(7.51X10^{-3} \pm 2.00X10^{-4})$ Scm^{-1}, and the value was enhanced to $(7.88X10^{-3} \pm 2.20X10^{-4})$ Scm^{-1} when 0.1 wt. % of SiO_2 was added.

CHAPTER 1

INTRODUCTION

1.1 Background

Lithium batteries are disposable (primary) batteries that have lithium metal or lithium compounds as an anode. Depending on the design and chemical compounds used, lithium cells can produce voltages from 1.5 V to about 3.0 V, twice the voltage of an ordinary zinc-carbon battery or alkaline cell.

Lithium batteries have dominated the field of advanced power source and replace many other batteries in the market, particularly in the area of communication, computer, electronics, and in more power demanding devices such as power tools and transportation. With dramatic increase on the size of the battery pack, there are growing in the significant progress of lithium batteries is mainly due to the numerous innovations in materials, design, and safety aspect of the batteries[1].

The term "lithium battery" refers to a family of different chemistries, comprising many types of cathodes and electrolytes. Recently, there are enormous active research have been done on the electrolytes for advance lithium batteries. The basic requirements of a suitable electrolyte for electrochemical devices are high ionic conductivity, low melting and high boiling points, chemical and electrochemical stability, and safety [2].