

**PREPARATION OF PVdF-HFP BASED ZINC ION CONDUCTOR AND ITS
APPLICATION IN RECHARGEABLE ZINC BATTERIES**

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ABSTRACT

PREPARATION OF PVdF-HFP BASED ZINC ION CONDUCTOR AND ITS APPLICATION IN RECHARGEABLE ZINC BATTERIES

Polymer is an important constituent of polymer gel electrolytes (PGE) along with salt and solvent. The salt provides ions for conduction and the solvent helps in the dissolution of the salt and also provides the medium for ion conduction. In this study, ethylene carbonate (EC) and propylene carbonate (PC) containing different concentration of zinc triflate $\text{Zn}_2(\text{CF}_3\text{SO}_3)_2$ salt were prepared to form liquid electrolyte. The optimum percentage of salt and plasticizer that gave the highest value of electrical conductivity of sample was determined. Impedance spectroscopy technique was carried out in order to determine the electrical conductivity value. The highest conductivity value of liquid electrolyte was $1.86 \times 10^{-3} \text{ S/cm}$ for 0.5M zinc triflate at room temperature. PGE was prepared by adding the highest conductivity value of liquid electrolyte with polymer host PVdF-HFP at room temperature, and the preparation conditions were optimized in view of ionic conductivity of the gel. The highest conductivity of PGE is $3.62 \times 10^{-3} \text{ S/cm}$. Finally, the highest conductivity plasticizer sample was used to fabricate battery. Battery was characterized using the open-circuit voltage and charge-discharge.

CHAPTER 1

INTRODUCTION

1.1 Background

Polymer systems have undergone development in recent years for use as electrolytes in modern power source applications such as fuel cells and secondary batteries. The most suitable battery type for customer's needs is that batteries contain a large amount of energy that uses polymer electrolyte. The field of polymer electrolytes is slightly more than a decade old. They consist of ionic salt dissolved in an appropriate polymer, which enable ionic conduction at room temperature. The ionic conduction is due to mobile anionic or cationic ions that act as the conducting species. The polymer acts as an immobile solvent for the ionic salt. Generally, polymer can be defined as a synthetic substance consisting of giant molecules formed from polymerization while an electrolyte is any substance containing free ions that behaves as an electrically conductive medium (*Arman M.B et al., 1987*). Beside that, polymer also can be defined as a compound consisting of a large number of repeating units, called monomers and it is linked together by covalent bonds.