

**PREPARATION AND ELECTRICAL CHARACTERIZATION BY
IMPEDANCE SPECTROSCOPY OF PVC+LiCF₃SO₃+TiO₂ NANOCOMPOSITE
POLYMER ELECTROLYTES**

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ABSTRACT

Nanocomposite polymer electrolyte were prepared by combining PVC as a host polymer, lithium triflate, LiCF_3SO_3 as doping salt and titanium dioxide, TiO_2 as filler with a different ratio. All the films were prepared by solution casting technique. The ionic conductivity of the films of at room temperature was determined by Impedance Spectroscopy technique. The ionic conductivity of pure PVC was $1.04 \times 10^{-10} \text{ Scm}^{-1}$. The highest ionic conductivity of PVC + LiCF_3SO_3 films determined was $1.017 \times 10^{-7} \text{ Scm}^{-1}$ for 40 wt % of LiCF_3SO_3 . This ratio was used further for the preparation of PVC + LiCF_3SO_3 + TiO_2 films by adding different ratio of TiO_2 filler. The highest ionic conductivity of PVC + LiCF_3SO_3 + TiO_2 film was $1.2556 \times 10^{-5} \text{ Scm}^{-1}$ at 8 wt % of TiO_2 . The ionic conductivity of nanocomposite polymer electrolyte increased from 10^{-7} to 10^{-5} Scm^{-1} . The ionic conductivity of PVC significantly increased by the addition of salt and filler.

CHAPTER 1

INTRODUCTION

1.0 Introduction

The general concept of nanocomposite polymer electrolytes based on inorganic fillers which are nanosize will be the focus of this work. A polymer electrolyte is a thin film that consists of a polymer host dissolved with salt. It has an important role in solid state ionic because of its unique properties such as ease of fabrication, improved safety, and smaller possibility of electrolyte leakage. The inorganic filler used in this study is chosen to be nanosize because it has several advantageous characteristics such as higher surface area of filler (Stephan et al., 2000), increased mobility, increase in the conductivity values of polymer electrolytes with nanofiller incorporated in them and also increase in intermolecular interaction in the polymer matrix (Shanmukaraj et al., 2005).

In this study, PVC is used as the host while LiCF_3SO_3 as the inorganic salt and TiO_2 as the filler. PVC is chosen as the host because of its low cost, versatility and its abundance since it is the material of choice for dozens of industries such as health care, communication, aerospace, automotive, retailing, textile and construction. TiO_2 is chosen as the filler because it has interesting chemical, electrical and optical properties.