ADVANCES IN MATERIALS ENGINEERING

Volume 1

Edited By:
Zahurin Halim
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Chapter 025

Effects of Sodium Dodecyl Benzene Sulphonate (NaDBS) on Li Imide-PMMA based Solid Polymer Electrolyte

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Abstract. The properties of solid polymer electrolyte (SPE) of Li Imide-PMMA based is modified by a small addition of sodium dodecyl benzene sulphonate (NaDBS). The ionic conductivity of the system increases up to 0.98wt% addition of NaDBS. This feature can be explained by the large molecular structure of DBS anions which acts as spacers between the polymer chains. This results in enhancement in both the ion dissociation and ionic mobility. These systems form a transparent and free standing SPE films. The systems are characterized using impedence spectrometer, X-ray Diffraction (XRD), Fourier Transform Infra Red (FTIR) analysis and UV-Visible spectrophotometer. XRD study reveals that the SPE film is amorphous. Meanwhile, UV-Visible spectrophotometer tests show that the SPE transparent films have excellent transmission modulation over the visible region. FTIR analysis indicates no complexation of NaDBS with Li Imide-PMMA system suggesting that DBS molecules only act as spacers for the system.

Introduction

SPE can be defined as a material consisting of ionic salts dissolved in an appropriate polymer, which enable ionic conduction at room temperature [1]. The ionic conduction is due to mobile anionic or cationic ions that act as the conducting species. Selection of materials is very important due to the ability of ions to dissociate and become mobile in the SPE .

PMMA is a transparent amorphous polymer which has a polar functional group which is the ester group. It exhibits a high affinity for both lithium ions and plasticizing agents. This feature is basically used for selecting the polymer host for SPE [2]. The functional group has a high donor electron number which enriches free ion fractions or ion dissociations in SPE. While a high chain flexibility of the polymer backbone allows for high ionic mobility.

In this paper we study the effect of sodium dodecyl benzene sulphonate (NaDBS) salt with big anion size on Li Imide-PMMA based SPE. Basically, salt with big anion size has low lattice energy which promotes better ion dissociation feature, hence providing better ionic mobility. Salts with big anion size have extensive dispersion of the negative charge that promotes plasticizing effect and free ion movement in SPE [3].

NaDBS consists of Sodium ion bonded to dodecyl benzene sulphonate (DBS) ion. DBS ion is formed by a combination of a benzene ring, a sulphonate group and an alkane hidrocarbon chain. Therefore, its large molecular structure can create spaces in the SPE system which increases the free volume of the SPE hence helps in free ion movement in the SPE system.