UNIVERSITI TEKNOLOGI MARA

CONDUCTIVITY, LIGHT RESPONSIVE AND THERMAL BEHAVIOR OF 4-METHOXY-4OXYAZOBENZENE DECYL METHACRYLATE POLYMER MEMBRANE

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ABSTRACT

The new ionically polymers have designed containing azobenzenes, sulfonic acid groups and methyl methacrylate. The 4-methoxy-4-oxy azobenzene decyl methacrylate and 4-methoxy-4-oxy azobenzene decyl methacrylate-co-poly[2-acrylamido-2-methyl-propane sulphonic acid]-co-poly[methyl methacrylate] were characterized by DSC,TGA,EIS and UV-VIS. The polymers have light responsive properties and liquid crystalline properties when characterized. P10 exhibit conductivities in range of $10^{-6.5}S \cdot cm^{-1}$ to $10^{-7}S \cdot cm^{-1}$ whereas p10h conductivities in range of $10^{-9.5}$ $S \cdot cm^{-1}$ to $10^{-10.5}$ $S \cdot cm^{-1}$. Higher conductivities due to AMPS content hence the disappearance of the anisotropic interactions between the mesogenic units at the clearing temperature may further enhance the conductivity of the p10 by an increase in their local mobility.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

Several liquid crystals have been designed to contain ion such as alkali and transition metals and ionogens such as sulfonic acid group to improve its properties. The uses of liquid crystals (LC) to control the ultrastructure of new ionomeric membranes, through the formation of mesophases in certain temperature and composition ranges. Liquid crystals containing ions (such as a transition metal ions) and ionogens (carboxylic and sulfonic acid groups) combine the formation of orientated anisotropic LC structures with the functionality of ionomers (Alfonso Martinez-Felipe,zhibao lu,peter A. Henderson,Stephen J.Picken,Ben Norder, 2011).Azobenzene on the other hand is a molecule consisting of two benzene rings bridged by a nitrogen-nitrogen. It consists of trans azobenzene and cis azobenzene which is one is more stable than the other. These aromatic side chains absorb UV light easier as it is stable thus the reaction is quicker. Hence azobenzene is famous in photo switches applications. The amount of journal and literature concerning the application of photochemistry of azobenzenes is well reviewed and therefore important to understand this topic for the development of biological photo switches in the upcoming research. Liquid crystal on the other hand, that derive the azobenzene to have the properties of photo induced isomerizations. Liquid crystals are very important even in our life as DNA, muscles, cell membrane and our brain consist of 70% liquid crystal. Liquid crystal polymers consist if main chain and side chain polymers. The mesogen is important part of a side chain polymer liquid crystal, can also incorporated directly into the chain. The basic components of LC polymers are polymer backbone, mesogenic core and the length of the flexible spacer group (Muhammad Tariq, Shahid Hameed,Rachel F. Magnago, Ivan H. Bechtold,Aloir A. Merlo, 2014).The decoupling (flexible) spacer concept opened the way to the whole variety of SCLCP materials with a wide range of structural design and synthetic methods, which in many cases undergo a dramatic change (Tomasz Ganicz and Włodzimierz Stańczyk , 2009). The attempts of synthesizing of the LC polymers with the mesogenic units in side-chain were stimulated by the fast progress of low molecular LC investigations. It seemed to be very