EFFECT OF ADDING POLY(PROPYLENE OXIDE) ON STRUCTURES AND PROPERTIES OF SOLID POLYMER ELECTROLYTES: POLY(ETHYLENE OXIDE)/SALT SYSTEM

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The objective of this research is to increase the ionic conductivity of the poly(ethylene oxide)/salt (PEO/salt) system. The researcher added poly(propylene oxide) (PPO) into the system, which is expected to increase the fraction of poly(ethylene oxide) and thereby increase the ionic conductivity. The research results obtained from various techniques such as XRD, DSC, FTIR, and stress testers showed that poly(propylene oxide) reduced the fraction of poly(ethylene oxide) and increased the ionic conductivity of the system. The trend of the ionic conductivity will increase with increasing salt content, reaching a maximum at a certain salt content and then decrease as the salt becomes too high. PE0/PPO/LiCF3SO3 will have a higher ionic conductivity than PE0/PPO/KSCN. The results of the study and theoretical values of PPO can be validated by the experimental results. The research was conducted in the Chemistry Department. 

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MISS PANITA DECHA: EFFECT OF ADDING POLY(PROPYLENE OXIDE) ON STRUCTURES AND PROPERTIES OF SOLID POLYMER ELECTROLYTES: POLY (ETHYLENE OXIDE)/SALT SYSTEM:


The objective of this research was to improve the ionic conductivity of poly(ethylene oxide) (PEO) based electrolytes. We added poly(propylene oxide) (PPO) which was used as the plasticizer to increase the fraction of the conductive amorphous phase. Variety of techniques, such as x-ray diffraction (XRD), infrared spectroscopy (FTIR), differential scanning calorimeter (DSC) and high resistance meter were employed to analyze the effect of adding PPO on the structure and ionic conductivity of PEO-salt (LiCF$_3$SO$_3$ and KSCN) solid electrolytes. The conformation of polymer played an important role for a better understanding of the conductivity and ion-polymer interaction of solid polymer electrolytes. Therefore, the conformational characteristics of PPO were studied by using the Rotational Isomeric State (RIS) Theory.

The results from XRD, DSC, FTIR and, high resistance meter suggested that PPO was able to decrease the crystallinity of PEO and improve the ionic conductivity of PEO-salts (LiCF$_3$SO$_3$ or KSCN) electrolytes. The PEO/PPO/LiCF$_3$SO$_3$ electrolyte exhibited higher ionic conductivity than that of PEO/PPO/KSCN electrolyte. The trend was observed in which the conductivity increased with increasing salt concentration to a maximum, then it decreased at very high salt concentration. The best compositions that gave the highest ionic conductivity of PEO:salt electrolytes were (1) the PEO:salt (O:M) ratio of 16:1 + 80 %wt PPO for PEO/PPO/LiCF$_3$SO$_3$ electrolyte and (2) the PEO:salt (O:M) ratio of 16:1 + 100 %wt PPO for PEO/PPO/KSCN electrolyte. Conformational dependent properties of PPO calculated from the RIS Theory gave the values that were closed to the experimental results.

สาขาวิชาเคมี ลายมือชื่อนักศึกษา

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