Plasticized Poly(vinyl chloride)-g-Poly(oxyethylene methacrylate) Graft Copolymer Electrolyte Membranes for Electrochromic Device

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Poly(vinyl chloride)-g-poly(oxyethylene methacrylate) (PVC-g-POEM) graft copolymer was synthesized via atom transfer radical polymerization (ATRP) and used as an electrolyte for electrochromic device. Propylene carbonate (PC)/ethylene carbonate (EC) mixture were introduced to the polymer electrolyte as a plasticizer. The effect of salt was systematically investigated using lithium tetrafluoroborate ($LiBF_4$), lithium perchlorate ($LiClO_4$), lithium iodide (LiI) and lithium bistrifluoromethanesulfonimide (LiTFSI). Wide angle X-ray scattering (WAXS) and differential scanning calorimetry (DSC) measurements showed that the structure and glass transition temperature (Tg) of polymer electrolytes were changed due to the coordinative interactions between the ether oxygens of POEM and the lithium salts, as supported by FT-IR spectroscopy. Transmission electron microscopy (TEM) showed that the microphase-separated structure of PVC-g-POEM was not greatly disrupted by the introduction of PC/EC and lithium salt. The plasticized polymer electrolyte was applied to the electrochromic device employing poly(3-hexylthiophene) (P_3HT) conducting polymer.