

Nanostructural amphiphilic graft copolymer electrolyte for dye-sensitized solar cells

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By using nanostructural amphiphilic graft copolymer electrolyte based on poly(ethylene glycol) behenyl ether methacrylate (PEGBEM) and poly(oxyethelene methacrylate) (POEM) synthesized via a facile free radical polymerization, the graft copolymer electrolytes were prepared. This was followed by the incorporation of an ionic liquid (i.e., 1-methyl-3-propylimidazolium iodide (MPII)). Using FT-IR spectra, it was revealed that the coordination interaction between the MPII cations and the ether oxygens of the PEGEM-g-POEM graft copolymer existed. Furthermore, the distinct structural amphiphilic properties of the graft copolymer were investigated by AFM images and SAXS analysis. It was confirmed that the incorporation of MPII reduced the degree of crystallinity of the graft copolymer by DSC and WAXS. The introduction of MPII reduced the degree of crystallinity of the graft copolymer. It was shown that the higher efficiencies of DSSCs were increased using graft copolymer-based cells (3.6%). In the case of the GCP3 graft copolymer electrolyte with PEGEM:POEM = 5:5, the highest efficiency (3.6%) was obtained. This resulted from the enhanced polymer flexibility and reduced crystallinity.