Effect of amphiphilic poly(ethylene glycol) electrolytes on Dye-Sensitized Solar Cells

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AmPEG was synthesized by modification of PEG which was used as a polymer matrix to prepare polymer electrolytes for TiO2-based DSSC. The interaction between the ether and ester oxygen atoms in the polymer and the lithium ion from LiI salt or the immidazolium ion from MPII was characterized by FT-IR, WAXS and DSC. FT-IR results showed lower ester and ether peaks for the pristine amPEG, indicating coordinative interactions among the polymer electrolytes. According to WAXS and DSC analyses, increased salt content in amPEG reduced the polymer crystallinity to a considerable extent, unlike in ionic liquid systems. The conversion efficiency of amPEG/MPII/I2 was 2.6% at 100mWcm−2. By increasing the MPII or LiI concentration the ionic conductivities of polymer electrolytes increased but compared to the amPEG/LiI system amPEG/MPII has higher ionic conductivity due to the higher mobility of MPII ion. The EIS technique was used to measure charge transport resistance and electron lifetime. The charge transport resistance in the TiO2/dye/electrolyte decreased from salt to ionic liquid containing electrolytes as well as shift in the characteristic frequency towards lower value, indicating a higher electron lifetime. FE-SEM showed good interfacial contact between the polymer electrolytes and the nanoporous TiO2 electrode.