Dye Sensitized Solar Cell using Polymer

Electrolytes based on Poly(ethylene oxide) with an
Ionic Liquid

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New Solar Cells based on dye-sensitized nanocrystalline porous TiO₂ film have been investigated intensively and have attracted widespread attention [1-2]. These cells usually employ a liquid electrolyte containing an I₃⁻/I⁻ redox couple in an organic solvent. However, the use of a liquid electrolyte results in the difficulty in the cell sealing and the decrease in the cell performance or lifetime during long-term operations due to evaporation or leakage of organic solvent. Polymer

electrolytes with ionic liquid (IL) may be suitable alternative to be used as electrolyte in DSSC application. In PEO- polymer electrolytes the high crystallinity/low ambient conductivity (σ) acts as a barrier, which affects the mobility of I₃⁻ species in polymeric medium and overall efficiency. In this paper, we used low viscosity ionic liquid 1-ethyl 3-methyl imidazolium thiocyanate in order to modify the conductivity of the polymer electrolyte (PEO-KIL) and to obtain the high efficiency. The doping of IL enhanced ionic conductivity (σ) of the polymer electrolyte, which attained maximum (σ = 7.62 x 10⁻⁴ S/cm) at 20 wt% of IL concentration (Fig. 1). Beyond this it was harder to

Figure 1. Composition dependence of room temperature ionic conductivity of (PEO-KIL)+x wt% IL polymer electrolyte films

Figure 2. DSC curves of (a) PEO-KIL, (b) PEO-KIL+40 wt% ionic liquid and (c) PEO-KIL+80 wt% ionic liquid polymer electrolyte films.

References