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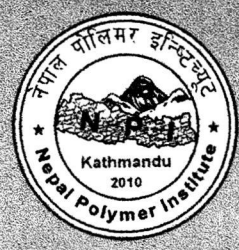
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SYNTHESIS AND CHARACTERIZATION OF BLENDED PVdF-PEO NANOCOMPOSITE POLYMER ELECTROLYTE AND ITS APPLICATION IN DYE SENSITIZED SOLAR CELLS

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In order to obtain the best, solidified polymeric electrolyte^{1,2} to be used in dye sensitized solar cell³ (DSSC) applications, the effect of solidification, crystallinity, redox couple concentration, choice of cations and additives in the polymer electrolytes were investigated with the blend of poly(vinylidene-fluoride) (PVdF) and polyethylene oxide (PEO). The best electrolyte with maximum solidification suitable for DSSCs showed high ionic conductivity in the order of $\sim 10^{-2}$ S cm⁻¹ at 343 K. The addition of ionic liquid 1-ethyl-3-methylimidazolium-bis (trifluoromethylsulfonyl) imide (EMITFSI) and nano size filler TiO₂ to the electrolyte reduced the crystallinity and enhanced the conductivity of the electrolyte. Out of various compositions studied, the best solidified polymeric electrolyte had the composition PVDF (3.78 %): PEO (3.78 %): PC (26.44 %): EC (26.44 %): ACN (11.87 %): KI (3.78 %) I₂ (0.06 %): EMITFSI (23.11 %): TiO₂ (0.76 %) : by weight ratio, and showed the lowest crystallinity, highest conductivity and the best photo-conversion efficiency in DSSCs fabricated using TiO₂ electrodes sensitized with Ruthenium polypyridyl (N719) dye. The cells delivered ~ 13 mA cm⁻² photo current density with an open circuit voltage of ~ 666 mV, yielding efficiencies $\sim 5\%$.

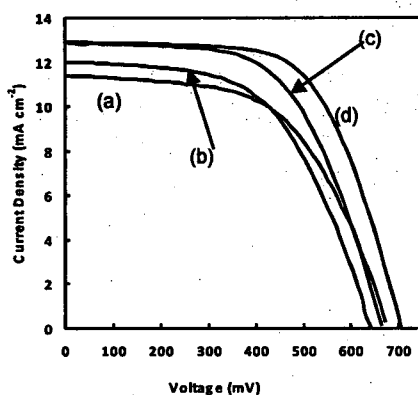


Figure: Photo current-voltage curves for solar cells fabricated with different electrolytes.(a) PVdF/PEO/EC/PC/CH₃CN/KI/I₂, (EL1) (b) EL1 /EMITFSI (c) EL1/ EMTFSI/TiO₂ (d) with liquid electrolyte (without PVdF-PEO).

¹Jayathilaka, P.A.R.D.; Dissanayake, M.A.K.L.; Albinsson, I.; Mellander, B.-E.; *Solid State Ionics*. 2003, 156, 179.

²Tennakone, K.; Senadeera, G.K.R.; Perera, V.P.S.; *Chem.Mater.* 1999, 11, 2474.

³Regan, B.O; Gratzel, M.; *Nature*. 1991, 353, 737.