QUASI-SOLID NATURAL RUBBER POLYMR ELECTROLYTES FOR DYE SENSITIZED SOLAR CELLS

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Recently, the use of modified natural rubber in polymer electrolyte systems has received much attention[1]. This is due to their distinctive characteristic such as low glass transition temperature, Tg, soft elastomer characteristics at room temperature, good elasticity and adhesion that making them a suitable candidate in polymer electrolyte systems. With these characteristics, it is predicted to give excellent contact between an electrolytic layer and an electrode in batteries[1,2].

To explore the possibilities of use of polymeric electrolyte comprising with natural Sri Lankan rubber in dye solar cells, quasi-solid state polymer electrolyte has been prepared from natural rubber comprising with ionic liquid, 1-methyl-3-n-hexylimidazolium iodide (IMI), chlorobenzene, propylene carbonate and iodine and tested its physical properties. Ruthenium dye sensitized TiO_2 based dye sensitized solar cells were fabricated and tested their performances with the above electrolyte. In order to get more solidified efficient, polymeric electrolyte, the effect of natural rubber content, redox couple concentration, I^-/I_3^- ratio on the solar cell performances were studied. The best electrolytes with reasonable solidicity, giving higher solar cells performances showed the conductivity in the order of 10^{-6} S cm^{-1}. The composition of the electrolyte was natural rubber (7.1% wt), Chlorobenzene (85.5% wt),IMI (3.49% wt), PC (2.92 % wt) and I_2 (0.99% wt) .The solar cell delivered a short circuit current density of 6.41 mA cm^{-2} with a photo voltage 595 mV under the illumination of 100 mW cm^{-2}.. The overall cell efficiency and the Fill factors were 2.35% and 62 respectively.

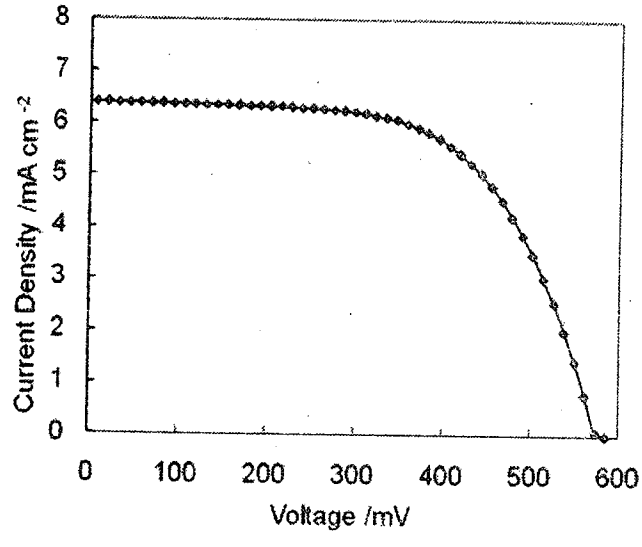

Figure 1. Current-voltage characteristics of the Dye solar cell with rubber polymer electrolyte.

[1] Abraham, K.M.; Alamigar, M. D.; *J. ElectrChem Soc.* **1990**, *137*, 1657.
[2] Bruce, P.G.; Vincent, C.; *J. Chem. Soc.* Faraday Trans, **1993**; *89*, 3187.