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Interfacial charge transport studies and fabrication of high performance DSSC with ethylene cored unsymmetrical dendrimers as quasi electrolytes

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Abstract

In this paper, authors focus the synthesis of conjugated unsymmetrical stilbenoid dendrimers by Heck and Horner-Wadsworth-Emmons coupling. In UV-visible absorption spectrum, the intensity of the absorption increases with increase in the generation of dendrimers. Further, bathochromic shift is observed on increasing the generation of the dendrimer from zero to first due to the greater widening of the energy gap between $\pi - \pi^*$ orbitals of the dendrimer system. Interfacial charge transport kinetics such as resistances, chemical capacitance and relaxation lifetime of the fabricated dye-sensitized solar cells (DSSC) are investigated using Nyquist and Bode phase plots by electrochemical impedance spectroscopy. Reduced electron relaxation lifetime (τ_e) of 1.83 ms (LiI+7) and 1.04 ms (LiI+8) provides efficient charge injection and thus reducing recombination process in the device. The performance of DSSC fabricated using unsymmetrical conjugated dendrimers with iodide electrolyte shows higher power conversion efficiency (PCE) than standard LiI based device. Two fold increments are achieved in PCE with first generation unsymmetrical dendrimers compared to their zeroth counterpart. The first generation unsymmetrical dendrimer **8** shows better PCE of 9.037% than all other synthesized dendrimers in the newly fabricated DSSC.

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