

Solid State p-Type Dye Sensitized Solar Cells

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P-type dye sensitized solar cells has been intensively investigated due to its potential application in tandem solar cells and solar fuel devices [1,2,3]. The efficiency of p-type DSC is limited by all the unsatisfying photovoltaic parameters, photocurrent, photovoltage and fill factor. Molecular engineering is an effective strategy to improve the photocurrent of p-type DSCs [4, 5]. In order to increase the photovoltage of this kind of device, new materials including p-type semiconductors with more positive Fermi Level or redox mediators with more negative redox potentials are required. So far, all p-type DSCs reported were constructed on the basis of liquid electrolytes. The fundamental concept proposed in our recent work is to investigate the potential of solid state p-type DSCs based on mesoporous NiO with an electron transport material as mediator undertaking the electron transport between two electrodes [6]. With an organic dye, we have fabricated a solid state device for the first time, which achieved a V_{oc} value up to 0.6 V. Transient absorption spectroscopy has been used to study the charge transfer mechanism in this novel device. Moreover, we also try to use TiO_2 instead of PCBM as electron collector and study the electron transfer kinetics in the new photocathode.

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