Diploma thesis abstract

Dye-sensitized solar cells with cobalt redox mediators

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Dye-sensitized solar cell (DSSC) is the one of the most promising type of solar cells. Redox mediator is a mixture of oxidized and reduced forms of the substance in which the oxidized form (oxidant) acts as an electron acceptor and is reduced by taking the electrons, and the reduced form of acting as an electron donor and oxidizes, giving electrons . Redox mediator performs the overriding function in DSSC . DSSC record samples prepared using cobalt redox mediators. In this paper we studied the DSSC with reference redox mediator $Co(bpy)_3^{+2/+3}$ and its modification $Co(bpyCN)_3^{+2/+3}$, which has a lower redox potential , to verify the possibility of increasing efficiency by lowering DSSC redox level of the redox mediator.

In this work we implement the DSSC assembly technique and implemented three research method: measuring VAC DSSC, measuring the decay kinetics of the open circuit voltage and measuring the VAC of samples with symmetric electrodes.

Our investigations have shown that for the construction of high-efficient DSSC with cobalt redox mediators one should use additives in the electrolyte to reduce recombination, select the dye with effective recovery by mediator and select the solvent with a high degree of redox mediator dissolution.

It has been shown that lowering the redox mediator potential can increase open circuit voltage and decrease the recombination rate of photoanode electrons with redox mediator oxidized form. This result suggests the presence of an inverted Marcus region in the reduction of the redox mediators, indicating the prospects of using cobalt redox mediators with low redox level for improving the efficiency of DSSC. We have tested two types of DSSC counter: platinum and carbon. It has been shown that the electrolyte additive 4TBP reduces recovery rate of the $Co(bpyCN)_3^{+2/+3}$ oxidized form in both counter types, thereby reducing the filling factor DSSC VAC.