Enhancement of Photovoltaic Performance of Dye-Sensitized Solar Cells by the Passivation of TiO_2 Photoanode with Oligomeric Co-Adsorbents

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The charge recombination at the TiO_2-electrolyte interface in dye-sensitized solar cells is considered to be one of major factors to determine the photovoltaic performance of DSSCs. In present work, we introduced oligomers containing COOH functional groups as a co-adsorbent along with ruthenium photosensitizer dyes adsorbed on TiO_2 nanostructured photoanode to reduce the electron recombination rate. The oligomer-based co-absorbent is anchored onto the surface of TiO_2 semiconductors, serving as a barrier to protect the interface between triiodides of electrolyte and electrons of mesoporous TiO_2 layer. At the same time, the co-adsorbent can influence on the shift of the band edge of the photoanode. We investigated the optimal condition using the oligomer-based co-adsorbent in order to improve photovoltaic performance as well as electrochemical properties. Specifically, photovoltaic performance and IPCE (incident photon to current efficiency) of DSSCs were evaluated. In addition, EIS (electrochemical impedance spectroscopy) was performed to analyze the effect of the co-adsorbent on the behavior of the TiO_2 photoanode in DSSCs.