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Abstract
Triphenylamine (TPA,TPD)- and ethylene dioxyl thiophene (EDOT,BT)-based metal-free organic dyes were synthesized and employed to the dye-sensitized solar cells (DSSCs) in this study. Metal-free organic dye, compared to the ruthenium-based photo-sensitizer in the dye-sensitized solar cells, has the advantages of high absorbance coefficient and without using expensive metal. We employed two kinds of organic synthetic methods. Different number of aldehyde groups were first linked on the molecules of TPA,EDOT,EDOT and BT by using the Vilsmeier-Haack reaction. Then, the metal-free organic dyes were obtained through the nucleophilic addition and dehydration between the aldehyde groups on TPA,EDOT,EDOT and BT and the methylene of rhodanine-3-acetic acid by using the Knoevenagel condensation reaction. The two dyes were anchored on the surface of titanium dioxide nanoparticles using the carboxylic acid of dyes by means of the self-assembly method. Furthermore, these dyes were also used to assemble the electrochromic device. A vertical integration of dye-sensitized solar cells and electrochromic devices was fabricated and subjected to measure the performance of the integrated devices.
Advisory Committee Chin-Hsin Yang ; Wei-Tung Liao - advisor

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