

Several Aspects of Organic Materials for Solid-State Dye-Sensitized Solar Cells and Their Spectroscopic Analysis

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Iodine-free solid-state dye-sensitized solar cells (sDSCs) have attracted lots of attention due to their potential applications in next generation energy conversion technologies including flexible solar cells. sDSCs, However, suffer from several problems such as poor charge transfer phenomena including fast charge recombination reaction and slow hole transfer yield from oxidized dye to the cationic hole transport materials (HTMs), resulting in poor charge collection efficiency at the photo-electrode. Several break-through has been made by the introduction of organic molecule as sensitizers to overcome the limitations by enhancing light harvesting ability as well as co-adsorbents to further optimize the charge transfer yield at the heterojunction of TiO₂/dye/HTMs. In this presentation, we attempted to prove the viability of organic materials for efficient sDSCs in comparison with the ruthenium counterpart from the spectroscopic viewpoint. Furthermore, we report several aspects of organic sensitizers for efficient charge transfer in sDSCs by chemical modification.