Study of optoelectrical properties of Dye-Sensitized Solar Cells

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ABSTRACT

The optimal Solar Cells must meet the following requirement: (1).Higher efficiency. (2).Low costs. (3).Good reliability and stability. (4)More Application. According to above-mentioned four points, because the cost and application are limited to the material problem in the traditional PV Cell, it is unable to get good improvement. Observe Dye-sensitized Solar Cells, because of its congenital advantage, the production cost is low and the application is extensive too, only efficiency and stability has not got good improvement yet, so it is incomparable research and development in the future. The modified Shockley equation were used to correlated the diode characteristic of dye-sensitized solar cells. The series resistance, Rs and diode quality factor, n were derived from the intercept and slope of corresponding equation, respectively. The Rs and n can be regarded as two of the most important criteria in evaluating the cell performance. The results show that the no. of spin-coated layers is proportion to the thickness of TiO2 thin film. Besides, the open circuit voltage, Voc of the as-deposited DSSCs always kept constant(500~520mV) until the thickness of TiO2 film reached certain value(20mm) after which the Voc of the cells decreased apparently. The optimal thickness of TiO2 film (Ln) calculated form photoelectron diffusion model theoretically was 10mm which is in accordance those obtained experimentally from our studies(dye: TCPP). The Jsc of as-prepared DSSCs were first increased as the thickness of TiO2 film increased. This tendency is coincident with those of Rs calculated from the modified Shockley equation. From the calculated values, the Rs reaches its minimal of 123W for four layers TiO2 thin films with thickness of 13mm while the maximum Rs has value of 506W for the TiO2 thin films with thickness of 27.5mm during which the Jsc became vague. However, no matter what the thickness of TiO2 film is, the FF seems to be kept within 0.33~0.35. One of the main reasons for such low value of FF might come from the instability of sensitized used in ous system.

Keywords : The modified Shockley equation ; dye-sensitized solar cell ; Series resistance ; diode quality factor ; future ; system ; after

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