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Investigation of photoelectrode materials influences in titania-based-dye-sensitized solar cells

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Abstrak

Solar cells are excellent devices which enable the provision of renewable energy in a safe and easy way. A dye sensitized solar cell (also referred as dye solar cell) is a new type of solar cell, whose operation is based on photoelectronic chemically activated mechanism. The fabrication of dye sensitized solar cells is generally simpler and cheaper compared to the conventional silicon-based solar cells. This paper aims to fabricate and analyze the performance of dye solar cell by comparing the utilization of transparent and opaque TiO2 pastes for the photoelectrodes. In addition, we also perform an analysis on the use of two different red ruthenium based dye, i.e. N-719 and Z-907. The current-voltage (I-V) measurements were performed by using an artificial sun-simulator on AM1.5 irradiation. As for the counter-electrode, platinum (Pt) was used as the catalyst which was deposited using DC-sputtering technique. Our results revealed that the cells featuring transparent TiO2 paste achieved better photoconversion efficiencies compared to that of the opaque paste. The best average efficiency achieved was 3.78% for cells with a total active area of 2 cm2 . In addition, transparent cells produced on average up to 3 mA higher photocurrent compared to that of the opaque cells. We suspected that such behavior was affected by the discrepancy in the crystallite size.