DUAL LAYER OF ELECTRON TRANSPORT LAYER IN Sb_2S_3 SOLID-STATE SOLAR CELL

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The electron transport layer (ETL) is a key component specially in planar structure solar cells. It is used to collect the electrons and reduce the recombination losses. ETL is chosen by considering the conductance, electrical trap density, and energy bandgap. Thus, TiO_2 and CdS are widely used as ETL in solar cells. Some simulation studies show the possibility of efficient solar cells minimizing or eliminating traditional electron transport material. However, the reported efficiencies are less compared to the efficiency of solar cells that use ETL. In this study, we developed the Sb_2S_3 solar cells due to the potential of Sb_2S_3 semiconductor material. The CdS solution was prepared by adding thiourea (TU) and cadmium acetamide (Cd(ac)) in 2-methoxyethanol and stirring until they completely dissolved. Likewise, a TiO_2 precursor solution was prepared by mixing titanium isopropoxide and di-ethanolamine in butan-1-ol. The CdS was spin-coated on the TiO_2 layer to prepare the dual-layer ETL while TiO_2 was used as a single ETL. Also, the thickness of CdS was controlled by the spinning speed of 2500, 3000, and 3500 rpm. The use of a dual ETL enhanced the charge collection hence, the performance of solar cells was improved compared to the single ETL. The increasing efficiency was observed up to a certain spinning speed of CdS then it was reduced. At 3000 rpm speed of CdS, the highest efficiency of 2.23% was achieved for dual layer ETL. This efficiency was nearly two times greater than a single ETL in our configuration.

***Keywords**: CdS, Dual-layer, Electron transport layer, Planar-Structure, TiO_2.*