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Impact of Metallic Contact Selection on the Efficiency of Sb2S3/CdS Solar Cells

Solar cells are essential for the transition to renewable energy, enabling the direct conversion of sunlight into electricity through the photovoltaic effect. In this context, the efficiency of the cells is crucial, and metal contacts play an essential role in optimizing their performance. These contacts extract and conduct the generated electrons, significantly influencing the efficiency and stability of the cell. The featured study examines the impact of various metal contacts on Sb2S3/CdS-based cells, highlighting how the proper choice of these materials affects the device's effectiveness. Electrical characteristics such as open-circuit voltage (Voc), short-circuit current (Jsc), fill factor (FF), and efficiency (η) were evaluated using the SCAPS simulation tool. Metals such as Silver (Ag), Iron (Fe), Silicon (Si), Molybdenum (Mo), Tellurium (Te), Beryllium (Be), Cobalt (Co), Gold (Au), Tungsten (W), Nickel (Ni), and Platinum (Pt) were selected based on their work functions, which are compatible with the Sb2S3/CdS heterojunction. This compatibility facilitates better extraction and transport of charges. The metals were chosen according to values suggested by flat band alignment calculations. The results showed that platinum contacts, with an efficiency of 30.29%, improve efficiency by 15% compared to silver, which has an efficiency of 14.32%. This underscores the importance of meticulous selection of metal contacts. These findings highlight how careful choice and optimization of metal contacts can significantly improve the efficiency of solar cells, contributing to the economic and technological viability of solar energy and promoting the development of more sustainable energy technologies.

Keywords

solar cells, metallic contact, scaps 1D

Reference

Numerical Simulation and Performance Optimization of a Solar Cell Based on WO3/CdTe Heterostructure Using NiO as HTL Layer by SCAPS 1D. José Carlos Zepeda Medina, et al. Coatings, 13, 1436 (15 de agostos 2023).

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