Photovoltaic Properties of Doped Zinc Sulfide/n-Si Heterojunction Thin Films

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doi: 10.20964/2018.02.50

Received: 16 October 2017 / *Accepted:* 13 December 2017 / *Published:* 28 December 2017

In this work, the current-voltage (I-V) characteristic curve of heterojunction solar cells based on pure ZnS and doped ZnS solid films have been studied. The films of pure and doped ZnS samples were deposited onto silicon substrates using the low-cost spray pyrolysis technique. Different weight ratios of Pb, Mn and Cu species were used for doping the ZnS films. The four-point probe electrical resistance technique has been used to measure thin films resistance, to evaluate the electrochemical performance of the hybrid solar cells. The photovoltaic properties and the forward I-V characteristics of the doped films were studied at room temperature. The solar cell efficiency, ideality factor, and other parameters were estimated. The results revealed that the efficiency, as well as the ideality factor, depends on the dopant concentration in the hybrid cells. The maximum power efficiency achieved was 3.5% at x=4% for $\text{Zn}_{1-x}\text{S:Pb}_x$, 1.84% at x=10% for $\text{Zn}_{x-1}\text{S:Mn}_x$, and 3.06% at x=8% for $\text{Zn}_{x-1}\text{S:Cu}_x$ structure.

Keywords: Photovoltaic properties; ZnS/n-Si; heterojunction solar cells; spray pyrolysis technique; efficiency; ideality factor.

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