Synthesis, Characterization and Optoelectronic Properties of Solar Cells Device for Vacuum Thermally Evaporated Pure and Gallium Doped CdSe Thin Films

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Abstract: Heterojunctions n-CdSe/p-Si, n-CdSe/P-Si and CdSe:Ga/p-Si have, through thermal evaporation, been based on P-type Si (002). Thin films with different doping ratios of 1, 3 and 5 wt percent are made. For the purpose of achieving optimal conditions the electrical and photovoltaic aspects of these films have been established. Solar cell quality is graduated. They were made of a vacuum heat evaporated mixture of CdSe and ga atoms to create a thin, p-Si single wafer film with a thickness of 3.5 μm and resistivity of 0.78-1.5 Ohm-cm-2 on R.T. They are then formed by n-CdSe/p-Si and n-Cdse(Ga)/p-Si heterojunctions. The density of the existing short circuit (jsc, open-circuit (Voc/fill factor (ff)) and conversion rate of 40 mW/cm2 (AM1) intensity. The efficiency of solar cells is calculated prior to and after a Ga dopant. The aim of this analysis was to determine characterization and optoelectronic characteristics of CdSe pure and gallium-doped solar cells in thin films. The result of this analysis under dark I-V conditions show good disciplinary behavior and an exponential relationship to the potential present bias. The calculation of the C-V suggested an abrupt form of heterozone diodes. The built-in potential Vbi is calculated and is found increasing after Ga-doping process. The built-in potential and the depletion width increases with increasing of Ga doping ratio.Solar cell conversion efficiency of n-CdSe/p-Si and n-CdSe:Ga/p-Si heterojunction properties were studied is found to be 5.25 % at 5 Wt% of Ga doping ratio. In conclusions, The I-V characteristic of Ga-doped CdSe solar cell thin film under the illumination conditions gives conversion efficiency of 5.25% at doping ratio 5%. This result of conversion is directly proportional to the Ga concentrations.

Keyword:
n-CdSe:Ga/p-Siheterojunction, Solar cell ,Open voltage circuit, Current circuit, Fill factor of solar cell.

1. Introduction: Cadmium Selenide (CdSe) is a promising material of thin film semiconductor II-VI compound due to its large absorption coefficients, a room temperature band gap of 1.74 eV and a high photo sensitivity. [1, 2]. Usually, CdSe is a n-type material are interested for their applications as photoconductors [3], solar cells [4,5], thin film transistors, gas sensors. The preparation of CdSe thin films by different methods have been used such as pulsed laser deposition technique, thermal, evaporation technique and spray deposition [6]. Ternary system of doped with other metal for increasing the short circuit current in the solar cell [7]. Investigations have also been made on the properties of CdSe devices with direct band gap of 1.74 eV device fabrications studied extensively. Mahawela *et al* [8] reported transparent thin films CdSe solar cells,