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Electrical properties of the CdS/InP heterostructures for photovoltaic applications

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Abstract

The n+-CdS/p-InP heterojunctions have been prepared by chemical vapor deposition in a quasi-closed volume and H2 transport of CdS on InP substrate. The n^+-CdS/p-p^+-InP heterojunction solar cells obtained using this technique and characterized in AM 1.5 illumination condition have showed a conversion efficiency of 12.6% at I_{sc}=16 mA/cm2, U_{oc}=(0.74–0.78) V. The I–V characteristics of the n-CdS/p-InP heterojunctions in dark condition was studied in the 100–300 K temperature range for charge transport mechanism investigation. It has been established that in the entire temperature range the charge transport mechanism is determined either by charge carrier tunneling or by recombination processes in the charge depleted region. In the direct bias condition and at low temperatures (T<150 K) the current is determined by charge carrier indirect tunneling and by generation–recombination and by tunneling processes at 300 K. The current at reverse bias in the temperature range (100–300) K is determined by charge carrier tunneling with local centers participation at low voltages and by interband tunneling at voltages >1.5 V.