

Thermal Conductivity and Optical Absorption of GaAsPN/GaP for Tandem Solar Cells: Effect of Rapid Thermal Annealing

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Abstract : Great efforts have been dedicated to obtain high quality of GaAsPN. The properties of GaAsPN have played a great part on the development of solar cells devices based in Si substrate. The incorporation of N in GaAsPN that having a band gap around of 1.7 eV is of special interest in view of growing in Si substrate. In fact, post-growth and rapid thermal annealing (RTA) could be an effective way to improve the quality of the layer. Then, the influence of growth conditions and post-growth annealing on optical and thermal parameters is considered. We have used Photothermal deflection spectroscopy PDS to investigate the impact of rapid thermal annealing on thermal and optical properties of GaAsPN. In fact, the principle of the PDS consists to illuminate the sample by a modulated monochromatic light beam. Then, the absorbed energy is converted into heat through the nonradiative recombination process. The generated thermal wave propagates into the sample and surrounding media creating a refractive-index gradient giving rise to the deflection of a laser probe beam skimming the sample surface. The incident light is assumed to be uniform, and only the sample absorbs the light. In conclusion, the results are promising revealing an improvement in absorption coefficient and thermal conductivity.

Keywords : GaAsPN absorber, photothermal deflection technique PDS, photonics on silicon, thermal conductivity

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