

Fabrication of GaAs Solar Cells on Silicon Substrates

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ABSTRACT

Compared with silicon solar cell, single junction GaAs and multi-junction InGaP/GaAs solar cell grown on single-crystal GaAs substrates have achieved record efficiency of 25.7% and 29.5%, respectively, under AM1.5 illumination. 40% of efficiency has been achieved on InGaP/GaAs/Ge triple-junction solar cells. Even so, a signification cost reduction is needed for application of these solar cells to terrestrial photovoltaic systems. The cost for the manufacture of GaAs based solar cell can be attributed to the usage of single-crystal GaAs or Ge substrates and the utilization of epitaxy technology. In the thesis, a cheap material, silicon, was adopted as substrates. In order to use Si substrates for the growth of GaAs solar cells, an amorphous Ge film was deposited on Si substrate surface. Then, the amorphous Ge film was re-crystallized by a thermal annealing process. Finally, GaAs solar cell structure was grown on the poly-crystalline Ge film/Si substrates.

Keywords : GaAs ; Solar cell ; Ge ; Recrystallization

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