

Comparison of the Performance of GaInAsSb and GaSb Cells under Different Temperature Blackbody Radiations

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Abstract : GaInAsSb cells probably show better performance than GaSb cells in low-temperature thermophotovoltaic systems due to lower bandgap; however, few experiments proved this phenomenon so far. In this paper, numerical simulation is used to evaluate GaInAsSb and GaSb cells with similar structures under different radiation temperatures. We found that GaInAsSb cells with n-type emitters show slightly higher output power densities compared with that of GaSb cells with n-type emitters below 1,550 K-blackbody radiation, and the power density of the later cells will suppress the formers above this temperature point. During the temperature range of 1,000~2,000 K, the efficiencies of GaSb cells are about twice of GaInAsSb cells if perfect filters are used to prevent the emission of the non-absorbed long wavelength photons. Several parameters that affect the GaInAsSb cell were analyzed, such as doping profiles, thicknesses of GaInAsSb epitaxial layer and surface recombination velocity. The non-p junctions, i.e., n-type emitters are better for GaInAsSb cell fabrication, which is similar to that of GaSb cells.

Keywords : thermophotovoltaic cell, GaSb, GaInAsSb, diffused emitters

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