

SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies and Concepts (3)

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RESEARCH AND FABRICATION OF INVERTED METAMORPHIC TRIPLE-JUNCTION SOLAR
CELL WITH 32% EFFICIENCY

Abstract

With the development of aerospace mission, it has higher requirements for the photovoltaic performance of the space solar cell. Because the band-gap of Ge subcell is relatively small, photoelectric conversion efficiency of the traditional lattice-matched GaInP₂/GaAs/Ge triple-junction solar cell has limited space to improve. Inverted metamorphic triple-junction (IMM-3J) GaInP₂/GaAs/InGaAs(1.0eV) solar cells have been developed at Shanghai Institute of Space Power-Sources (SISP). InGaAs Subcell has been fabricated by using low-temperature large-mismatch and step-graded buffer layers synthetically and the high quality of these sub-cells has been confirmed by XRD test. With the world's advanced level, the 32.12% maximum efficiency (AM0 135.3mW/cm² 25 degrees) IMM-3J GaAs based solar cell have been successfully attained after the structure of as grown samples reversed through wafer bonding and substrate-removal technique. Spectral response measurement results showed that the subcells had excellent internal quantum efficiency and the short-circuit current matched. The high efficiency IMM-3J solar cell was successfully fabricated by SISP, which make efforts of development of multi-junction GaAs solar cell technology.