Radiation Resilience of Industry-Grade CdSeTe/CdTe PV Cells For Space Applications

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Abstract:

The University of Toledo's PVIC, in collaboration with First Solar, Aerospace Corporation, and Auburn University, has conducted ground-based proton and electron radiation experiments on industry-grade CdTe platform solar cells. The cells under study are based on a CdSeTe/CdTe bilayer light absorber fabricated by vapor transport deposition, and samples include two varieties of dopant -- conventional copper (Cu) and the more recently introduced arsenic (As). Cells were fabricated using standard commercial processes. Cell coupons were subjected to proton radiation exposures in the range of 150 - 1000 keV, with fluences of 1 x 10^{11} cm^{-2} to ~10^{14} cm^{-2}. Displacement damage dose analysis of remaining factors (Jsc, Voc, FF, and photoconversion efficiency (PCE)) has been completed for proton-irradiated cells, and a SPENVIS-derived spectrum for a circular 400 km orbit at 51.6° inclination (LEO) was applied and analyzed to determine performance degradation for various EOL mission durations. Results show promising proton radiation hardness for CdSeTe cells as compared with previously-published results for GaAs/Ge and other space-relevant PV material technologies. Electron radiation studies, with exposures up to 1 x 10^{15} cm^{-2}, are in progress.

Conflicts of Interest

The authors declare that no conflict of interest exists.

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