Highly efficient thin film CdTe solar cells for aerospace applications

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Cadmium telluride (CdTe) thin film solar cells are expected to rise as future energy devices for space applications. CdTe is a suitable material for extraterrestrial use owing to its high threshold atomic displacement energies, exhibiting stability against proton and electron irradiation. To evaluate its feasibility as photovoltaics for space applications, thin film CdTe solar cells were fabricated on ultralight glass substrate, which contributes to achieving high power conversion efficiency (PCE) and high specific power. Typical post-deposition processes are in following sequence: $CdCl_2$ activation, followed by nitric-phosphoric (NP) etch step. NP etch is an essential step of the process. In this study, three different sequences are conducted to investigate how NP etching step affects photovoltaic properties of CdTe solar cells.
Afterwards, 15 MeV proton beams with various fluences were used to irradiate thin film CdTe solar cells to assess their radiation hardness. The relative PCE and specific power maintained even after the cells were subjected to high proton irradiation dose (1×10^{15} cm^{-2}), which is comparable to harsh conditions of low-earth orbit.