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Rapid thermal cycling of perovskite solar cells

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The increasing progress in developing next generation thin-film solar cells for space is shifting the focus of research towards practical implementation issues. Among the different types of next generation solar cells, in particular perovskite solar cells are gaining an increasing attention for space use. Meanwhile, first perovskite materials and devices have been tested in space. In contrast to terrestrial applications, solar cells in space are subject to extreme temperature fluctuations caused by rapidly alternating illumination and dark phases. In detail, they depend on the targeted mission. The thin-film architecture and, consequently, the low heat capacity per area of the devices additionally increase occurring temperature gradients and thereby add stress to the materials and devices.
Besides direct testing in space, also simulated space conditions tested on earth give valuable information. We investigate the effects of rapid temperature changes from 100 down to -196 ℃ on perovskite solar cells. The influence on the device performance is measured via IV measurements. Structural changes are characterized by SEM and X-ray diffraction measurements. Thus, the interplay between performance and micro- and meso-scale changes of the structure is gained, thereby providing further insights into the potential range of applications of perovskite solar cells in space.

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