

# Understanding Crystal Growth Dynamics of Perovskite on Textured Silicon Substrates for Multijunction Solar Cell Applications

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## Abstract

In the industry, double-sided textured (micro-meter sized pyramid) silicon is commonly produced to decrease reflection losses and improve light trapping. Solution-based processing methods of perovskite on top of the textured Si showed low conformality, which resulted in shunts and non-working solar cells. To overcome this issue, physical vapor deposition (PVD) is used for the different precursors to conformally coat the perovskite on the silicon pyramids. In this study, we investigate a processing method namely the hybrid route, in which inorganic precursors are co-evaporated using the thermal vapor deposition technique and then organic precursors including additives are spin-coated, followed by a thermal annealing. By doing that, high conformality of high-quality perovskite thin films on top of the textured silicon is achieved as well. In the hybrid route, we also study the crystallization dynamics at different stages of the hybrid route and the effect of grain sizes on FF and open circuit voltage ( $V_{OC}$ ).

## Keywords

Hybrid Route, Additives, Perovskite Silicon Tandem Solar Cells, Crystallization