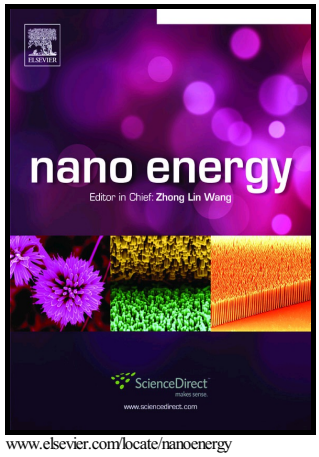

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Abstract

Back-contact electrodes have been broadly applied to silicon photovoltaics to enhance their performance and avoid parasitic absorption from window materials and charge collection grids [1,2]. Here we introduce an innovative back-contact design for perovskite solar cells (PSCs) derived from our recently described quasi-interdigitated back-contact architecture [3]. The back contact consists of a top electrode, which has a honeycomb-like grid geometry, that is separated from the underlying planar bottom electrode by a similarly shaped insulating Al_2O_3 layer. This new design has higher structural robustness, as well as better defect tolerance, resulting in the highest short-circuit current (~ 16.4 mA/cm^2) and stabilized power output (~ 4%) for a back-contact PSC to date. The improved performance was attributed to an increased charge collecting efficiency, with photocurrent mapping revealing what electrode dimensions are required for optimum efficiency.

Graphical abstract