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Investigate the impact of Zinc Oxide nanostructures morphology on Perovskite Solar Cell performance synthesized by the hydrothermal method.

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Abstract: Zinc oxide (ZnO) has been widely studied over the last decade for its remarkable properties in optoelectronic and photovoltaic devices because of its high electron mobility and excitonic properties. It has probably the broadest range of nanostructured forms that are also easy and cheap to synthesize using a wide variety of methods. The volume of recent work on ZnO nanostructures and their devices can potentially overshadow significant developments in the field. Therefore, there is a need for a concise description of the most recent advances in the field. In this review, we focus on the effect of ZnO nanostructure morphologies on the performance of ZnO-based solar cells sensitized using methylammonium lead iodide perovskite. We present an exhaustive discussion of the synthesis routes for different morphologies of the ZnO nanostructure, ways of controlling the morphology, and the impact of morphology on the photoconversion efficiency of a given perovskite solar cell (PSC). We find that although the ZnO nanostructures are empirically similar, one-dimensional structures appear to offer the most promise to increasing photoconversion efficiency (PCE) by their proclivity to align and form vertically stacked layers. This is thought to favor electron hopping, charge mobility, and conductivity by allowing multiple charge conduction pathways and increasing the effective junction cross-sectional area. The combined effect is a net increase in PCE due to the reduced surface reflection, and improved light absorption.

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