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Fibrous electron-selective layer for highly efficient flexible perovskite solar dev

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Over recent few years special attentions to the low-dimensional materials with large specific surface area, such as thin films and nano fibers has significantly improved the performance of advance optoelectronic devices. High demands for design and development of low cost and portable energy sources has drawn tremendous interests in low cost and flexible photovoltaic cells. Here we introduce a new configuration for perovskite solar cell (PSCs), employing SnO_2 nano fibers, as electron-selective layer. Traditionally the charge selective layers in tandem PSCs are made of inorganic components such as metal oxides and their hybrids, which require expensive and high energy-consuming casting sterategies like CVD or solution deposition, followed by sever thermal annealing [1, 2]. Incorporating the carbon derivatives such as fluorine and PCBM have been widely reported [3], however carbon materials suffers from the mismatch of band alignment, suppressing efficient charge extraction and significant loss of Voc. In this report SnO_2 nano-fibers are prepared at room temperature, using an advanced Electrospinning procedure. Nano-fibers are deposited on a flat substrate which is subjected to an intensive ultrasonic vibration (40 kHz). Acoustic streams and waves induced by ultrasonic vibration can control the dimensions of nano-and evenly disperse them over the substrate [4], making a Fibrous Thin film, which is integrated into a perovskite solar cells as the ETL, and the scaffold layer for controlling the crystallization of upcoming perovskite layer. This novel architecture benefits from the large surface area and robust charge transfer offered by SnO_2 nano-fibers. In the meantime, the fibrous SnO_2 layer made at low temperature will be quite compatible with high efficient flexible solar cells. This approach holds great promises for production of paper-based and plastic-based energy reservoirs.

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