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LOW-COST PEROVSKITE SOLAR CELLS BASED ON ACTIVATED COCONUT SHELL CHARCOAL AS THE HOLE-TRANSPORT LAYER

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Perovskite solar cells (PSCs) have attracted intense attention due to their record high conversion efficiencies. A PSC is a type of solar cell that replaces the dyes used in dye-sensitized solar cells by a perovskite-structured compound; most commonly, a tin halide-based material or a hybrid organic-inorganic lead halide as the light-harvesting active layer. These solar cells give over 22% efficiency when spiro-OMeTAD is used as the hole-conducting material. However, the cost of spiro-OMeTAD is unbearably high, and researching for low-cost alternatives is obligatory for the practical applications of PSCs. As such, in this study, a low-cost PSC was fabricated using activated coconut shell charcoal (ACSC) powder which was prepared by activating CSC at high temperatures, in the range from 500 °C to 1000 °C, followed by immediate quenching in water and drying the powder thus obtained at 100 °C. The ACSC was powder-pressed on to the perovskite layer present on the working electrode, without using any solvent or binder, and the counter electrode was pressed on it to complete the solar cell. The working electrode of the PSC was fabricated using solution-processed methylammoniumlead halide deposited on an FTO plate, and a platinum-coated FTO glass plate was used as the counter electrode. Solar cells were prepared using ACSC prepared at different temperatures, and their efficiencies were measured. The solar cell made using ACSC powder activated at 950 °C has the highest conversion efficiency of 4.94% under AM 1.5 simulated sunlight under ambient conditions.

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