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Electrical characterization of vacuum-deposited all-inorganic perovskite solar cells

Organic-inorganic perovskite solar cells suffer from low stability and the solution methods used for fabrication are not always scalable or reproducible. Perovskite solar cells with inorganic absorber layers and charge transport layers are an attractive route towards achieving long-term stability. Additionally, resistive evaporation allows for scalable and reproducible thin films. The $CsPbBr_3$ active layer is prepared using the multi-step sequential resistive evaporation of CsBr and $PbBr_2$. Charge transport layers are prepared using resistive evaporation of the metal followed by thermal oxidation to form a metal oxide. These layers are combined to form an all-inorganic, solvent-free solar cell. The optical bandgaps of the devices are found using ultraviolet-visible spectroscopy. Current-voltage measurements are used to determine the power conversion efficiency of the devices and to show hysteresis effects. Current-time measurements are used to show electronic and ionic responses under different biasing conditions. Impedance spectroscopy is measured with different voltages and light biasing to determine an equivalent circuit for the devices.

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