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Tuning the bandgap of double perovskite by anion exchange

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Double perovskites, a relatively new kind of lead-free perovskite materials, have emerged with compelling characteristics, including low toxicity, extended carrier lifetime, and a small effective carrier mass. These unique attributes make them promising material for photovoltaic applications and draw considerable research interest. Among bismuth-based double perovskites, Cs2AgBiX6 (where X can be Cl, Br, or I) has stood out for its potential in photovoltaic applications, primarily attributed to its suitable bandgap. Some researchers studied thermoelectric properties of double halide perovskite Cs2AgBiI6 and proved that it is an excellent candidate for thermoelectric applications. They also investigated that Cs2AgBiI6 nanocrystals possess narrower bandgap than other halide Cs2AgBiX6. Thus, increasing the content of iodide ions in Cs2AgBiX6 can effectively narrow the band gap. In this work, the iodide ions will be introduced to Cs2AgBiBr6 by adding TMSI when spin-coating. It is reported that no more anion exchange happened with more TMSI. Therefore, Cs2AgBi(BrxI1-x)6 perovskite solar cells will be fabricated by solution method. The anion exchange process will be studied in this work. Morphology, device characterizations techniques like XRD, SEM, J-V curves, EQE spectra etc. would be taken to help optimize the morphology of thin films and PCE of solar cells. In-operando studies will be taken to identify morphology changes during device operation.

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