$CsPbI_3$ for Perovskite Solar Cells: applications and perspectives

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All-inorganic Cesium lead iodide ($CsPbI_3$) is one of the most promising perovskite composition due to its superior thermal stability with respect to the organic cation-based perovskites like $MAPbI_3$ and $FAPbI_3$. A stable photoactive CsPbI3 black-phase can be obtained through two different temperature routes: 1) a low temperature (LT) route (80-100 °C)[1-2] by using specific additives like hydroiodic acid (HI), organic ligands or elemental doping like Europium (Eu) and 2) a high temperature (HT) route by annealing the film at 320-350 °C and rapidly cooling it at RT. The LT black phase is integrable into silicon-perovskite tandem solar cells due to its optimal bandgap of ~1.73 eV and to the low formation temperature which preserves the underlying silicon solar cell, sensitive to temperature >200 °C. On the other side, the HT black phase opens interesting perspectives on the reuse and re-cycle themes. It comes out from the reversibility of the non-photoactive yellow phase towards the photoactive black phase without mass loss thanks to the all-inorganic nature of $CsPbI_3$.

Recycling is potentially feasible over infinite cycles by thermally reconverting the black phase from the yellow phase.

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