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Optimization of Hybrid Perovskite Thin Films as Luminescent Solar Concentrators[1] BENAZ MENDEWALA, KATERINA NIKOLAIDAU, SOM SARANG, CHRISTINE HOFFMAN, VINCENT TUNG, BOAZ ILAN, SAYANTANI GHOSH, Univ of California - Merced — Thin film hybrid perovskites have emerged as exciting new materials for photovoltaic applications owing to their broad absorption, large Stokes shift and high quantum yield. These traits also make them excellent candidates for luminescent solar concentrators (LSCs). Following synthesis and optical and electronic characterization of 16 perovskite thin film composites with varying lead halide precursors and film thickness, we report high optical efficiencies in the range of 21- 35%, making these devices competitive with other top-performing LSCs. We input experimental results including surface morphology, self-absorption and quantum yield into three-dimensional Monte Carlo simulations. Comparing and contrasting the simulated outcomes with device performance leads to the conclusion that quantum yield is the most critical parameter for optimizing LSC efficiency. Additionally, we demonstrate that while perovskite based solar cells degrade rapidly, our devices remain functional for up to two months under ambient conditions.

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