

Abstract Submitted  
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**Lead-free All-perovskite Tandem Solar Cell**<sup>1</sup> ARMAN DUHA, MARIO BORUNDA, Oklahoma State University-Stillwater — We simulated a lead-free all-perovskite tandem solar cell using the SCAPS-1D simulation tool. The purpose of this work is to assess the performance of alternatives to lead-based perovskite in a tandem structure. First, the top and bottom subcells, consisting of  $\text{MAGeI}_3$ , and  $\text{FASnI}_3$ , respectively, were optimized individually by varying material properties such as thickness, electron affinity, and capture cross-section. These standalone optimized subcells are then utilized for the tandem structure. The final tandem cell thickness was determined based on short circuit current density ( $J_{SC}$ ) matching of the standalone subcells by means of varying the thickness of the subcells. A matching  $J_{SC}$  of  $14.75 \text{ mA/cm}^2$  was obtained for the top and bottom subcell thickness of 970 nm and 1400 nm, respectively. At this current matching condition, the tandem cell yielded a very high open-circuit voltage ( $V_{OC}$ ) of 2.63 V, resulting in an efficiency of 30.89% which is significantly higher than that of the single junction.

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