Supporting Information

Metallic Tin Substitution of Organic Lead Perovskite film for Efficient Solar Cells

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Fig. S1 The SEM-EDS mapping of MASnₓPb₁₋ₓI₃₋₁d

Fig. S2 Cross-sectional SEM image of FTO/PEDOT:PSS/ MASnₓPb₁₋ₓI₃₋₁d/ PCBM/C₆₀/Ag device structure
Fig. S3 XRD patterns of PbI$_2$ film and MAI film reacted without/with Sn metal and filtered, respectively, and starting materials Sn powder, PbI$_2$ powder, and MASn$_x$Pb$_{1-x}$I$_3$ with different Sn substitution time, 0d (MAPbI$_3$), 0.5d, 1d, 2d, 4d, and 7d.
Fig. S4 XPS spectra of MASn\textsubscript{x}Pb\textsubscript{1-x}I\textsubscript{3}-1d

Fig. S5 J-V curve of (a) MASn\textsubscript{x}Pb\textsubscript{1-x}I\textsubscript{3}-1d and (b) MAPbI\textsubscript{3}
Fig. S6 Average photovoltaic parameters of MASn$_x$Pb$_{1-x}$I$_3$ perovskite solar cells: (a) Voc, (b) Jsc, (c) FF, and (d) PCE.

Fig. S7 The photograph of MASn$_x$Pb$_{1-x}$I$_3$-7d (a) and MASn$_x$Pb$_{1-x}$I$_3$-1d (b)