Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Formation of Cubic Perovskite Alloy Containing the Ammonium Cation of 2D perovskite for High Performance Solar Cells with Improved Stability

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Table S1. Calculated Goldschmidt tolerance factor for alloy perovskites

Compound	r_I/pm	$r_{pb/}\,pm$	r_{FA}/pm	r_{MA}/pm	$r_{EA/}\,pm$	$r_{BA/}\,pm$	**t factor**
$MA_{0.67}FA_{0.33}PbI_3$	220	119	253	217			0.9363
$MA_{0.5}FA_{0.5}PbI_3$	220	119	253	217			0.9491
$MA_{0.83}EA_{0.17}PbI_3$	220	119		217	274		0.9317
$MA_{0.65}FA_{0.3}EA_{0.05}PbI_3$	220	119	253	217	274		0.9400
$MA_{0.53}FA_{0.38}EA_{0.09}PbI_3$	220	119	253	217	274		0.9508
$MA_{0.65}FA_{0.30}BA_{0.05}PbI_3$	220	119	253	217		517	0.9653

The Goldschmidt tolerance factor, t, defined as follows: $t = (r_A + r_I)/\sqrt{2}(r_{Pb} + r_I)$, where r_A, r_{pb} and r_I are the effective radii of cation, Pb^{2+} and I^- ions, respectively. The cation radii in mixed-cation materials were calculated based on a weighted average of the radii of cations

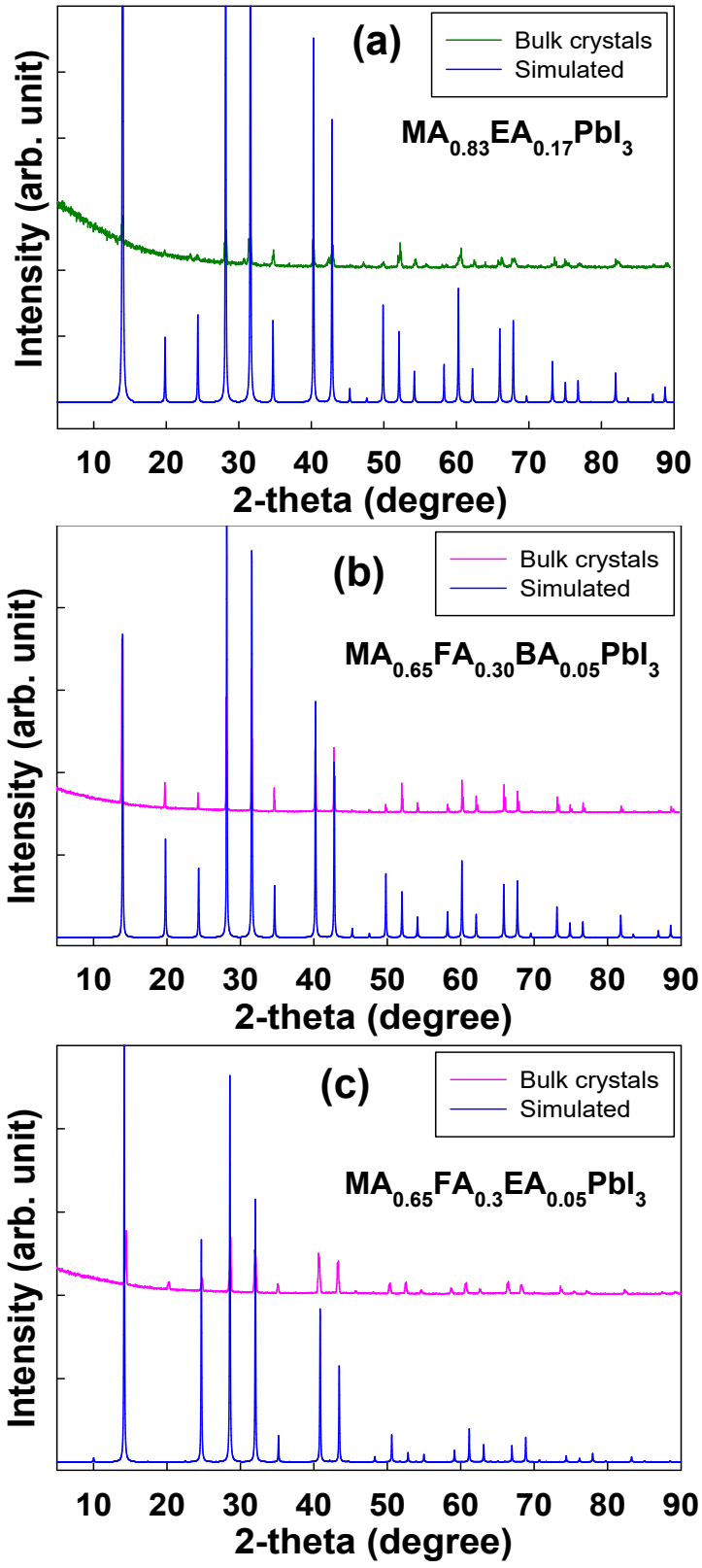

Figure S1. Powder X-ray diffraction and the simulated pattern from SCXRD for the $MA_{0.83}EA_{0.17}PbI_3$, $MA_{0.65}FA_{0.30}BA_{0.05}PbI_3$ and the $MA_{0.65}FA_{0.3}EA_{0.05}PbI_3$ perovskites

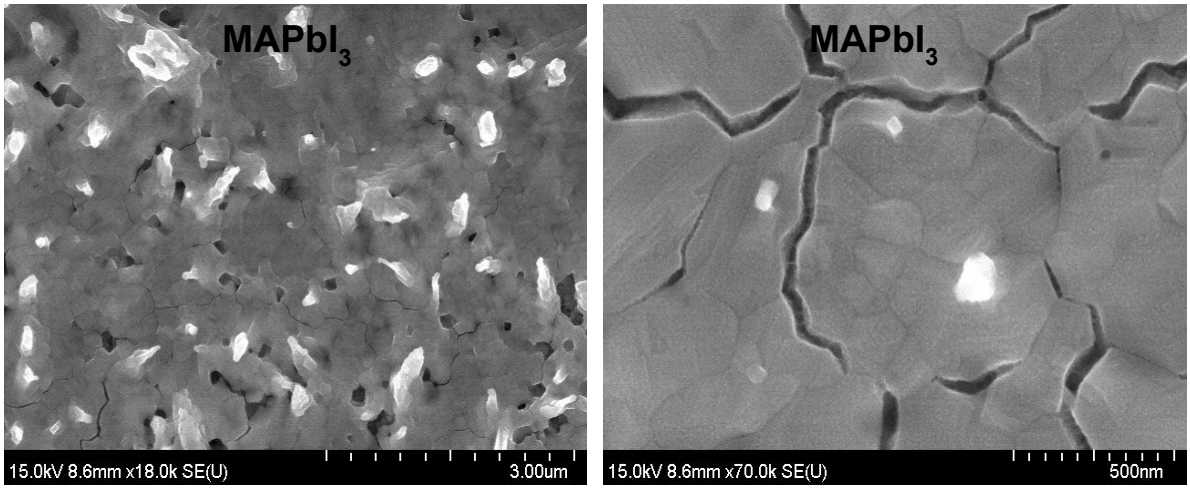

Figure S2. The low and high resolution of SEM images of $MAPbI_3$ perovskite films.