SUPPORTING INFORMATION

Transformation of PbI_2, $PbBr_2$ and $PbCl_2$ Salts into $MAPbBr_3$ Perovskite by Halide Exchange as an Effective Method for Recombination Reduction

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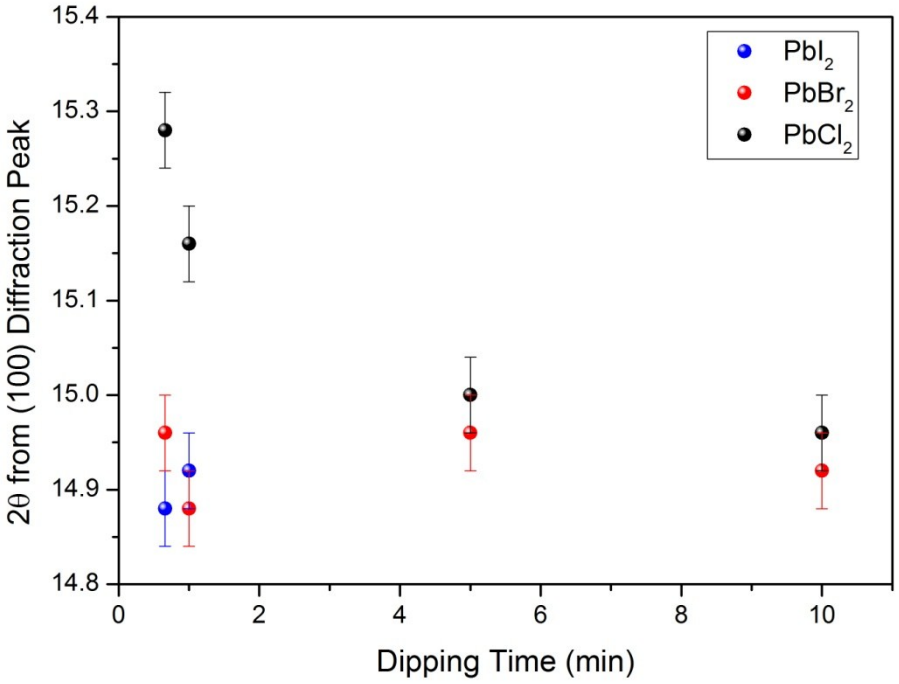
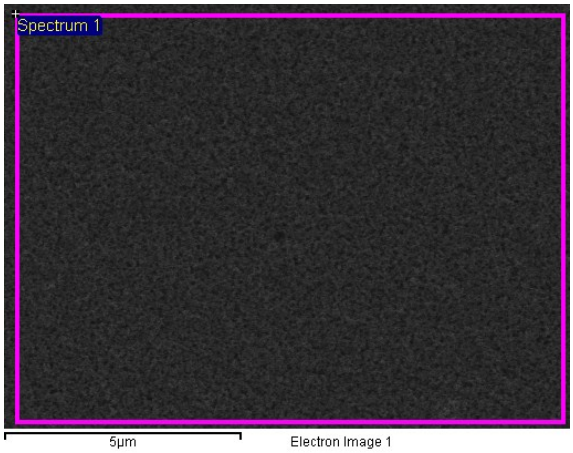
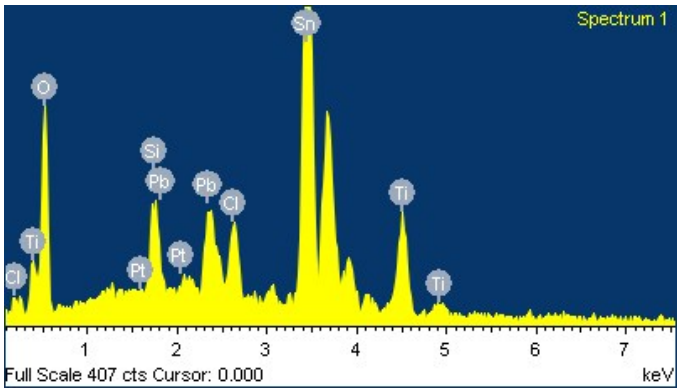


Fig. S1. Diffraction angle 2Θ from the perovskite (100) planes measured at different dipping times starting from different PbX_2salts. Error has been assigned considering the 2Θ used in the measurement. At 5 and 10 min dipping times PbI_2 and $PbBr_2$ peaks overlaps.

S2. Energy-dispersive X-ray (EDX) Analysis

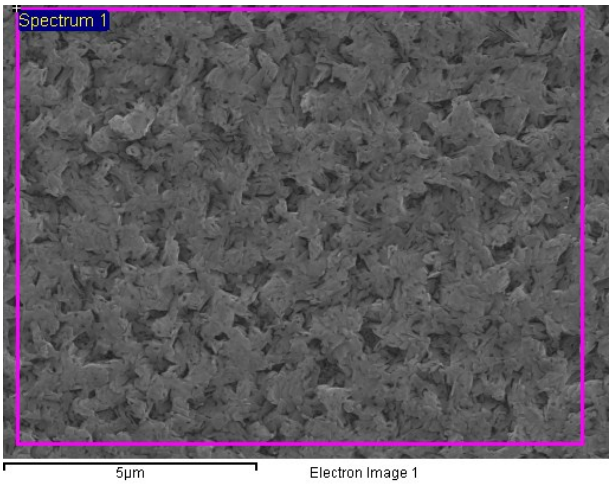
(a) $PbCl_2$

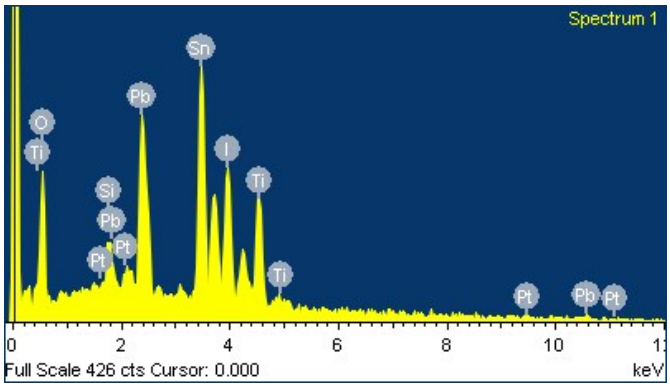




Element	Weight (%)	Atomic (%)
O K	39.75	79.19
Si K	1.90	2.15
Cl K	2.28	2.05
Ti K	6.10	4.06
Sn L	42.39	11.38
Pb M	7.58	1.17
Totals	100.00	

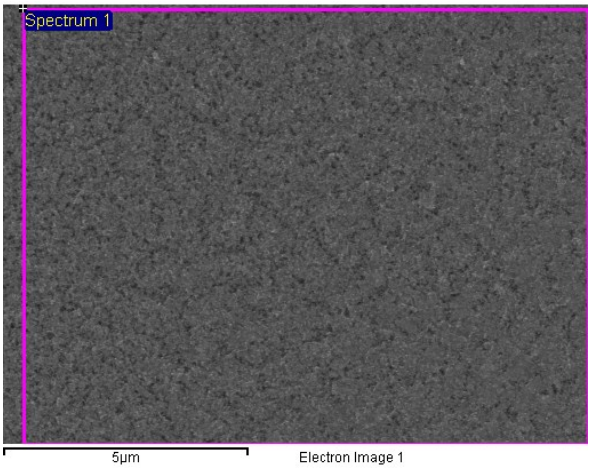
(b) PbI_2

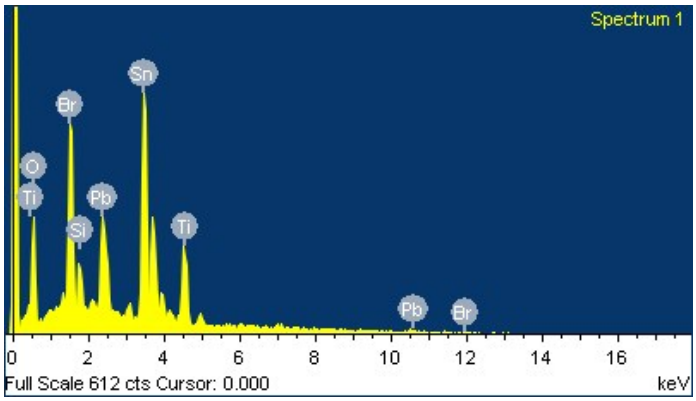




Element	Weight (%)	Atomic (%)
O K	25.12	69.76
Si K	1.21	1.91
Ti K	7.33	6.80
Sn L	29.99	11.22
I L	18.51	6.48
Pb M	17.84	3.83
Totals	100.00	

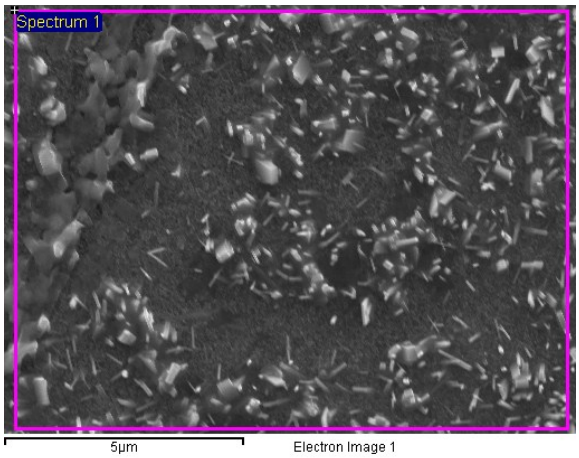
(c) $PbBr_2$

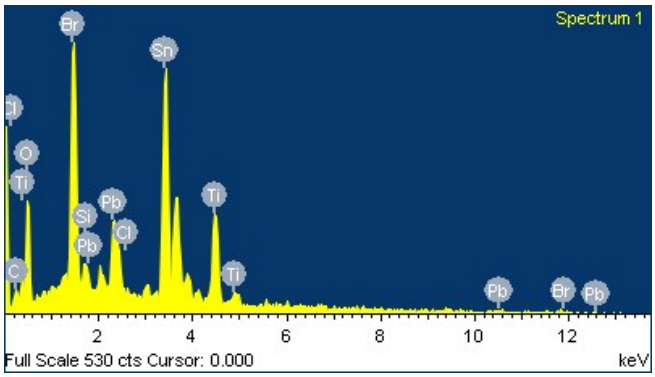




Element	Weight (%)	Atomic (%)
O K	31.76	73.47
Si K	1.54	2.04
Ti K	7.52	5.81
Br L	11.96	5.54
Sn L	35.34	11.02
Pb M	11.87	2.12
Totals	100.00	

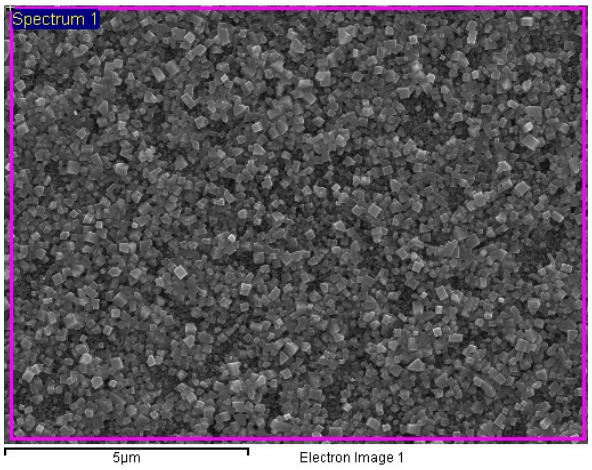
(d) $MAPbBr_3$ (from$PbCl_2$salt)

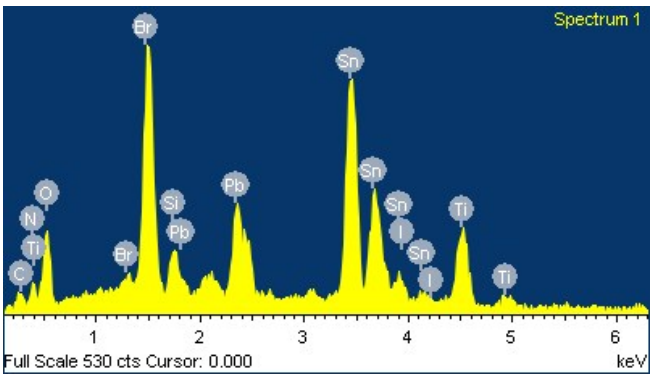




Element	Weight (%)	Atomic (%)
C K	4.49	12.87
O K	29.04	62.49
Si K	0.78	0.96
Cl K	0.00	0.00
Ti K	8.40	6.04
Br L	14.89	6.42
Sn L	33.76	9.79
Pb M	8.64	1.43
Totals	100.00	

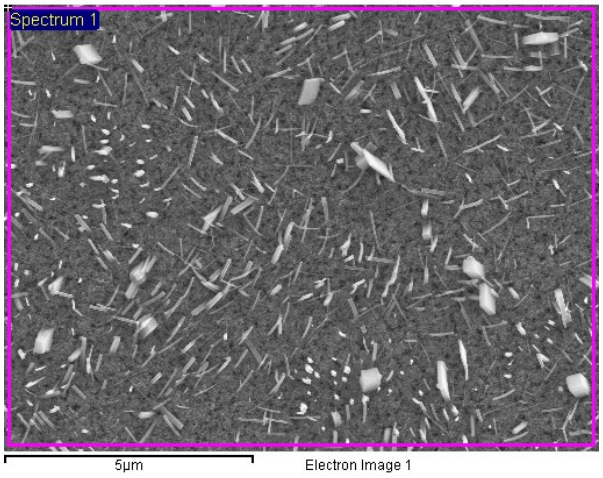
(e) $MAPbBr_3$ (from PbI_2salt)

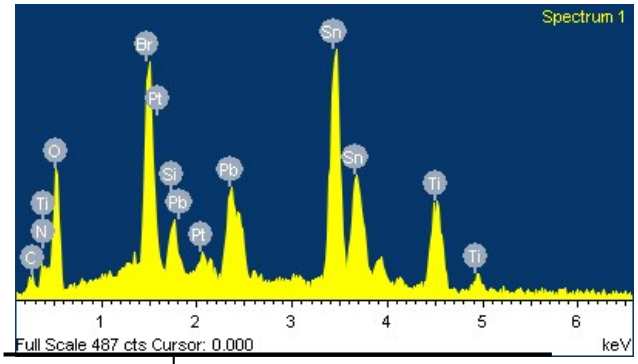




Element	Weight (%)	Atomic (%)
C K	5.57	17.80
O K	22.11	53.02
Si K	1.43	1.96
Ti K	7.40	5.93
Br L	15.14	7.27
Sn L	36.76	11.89
I L	0.00	0.00
Pb M	11.59	2.15
Totals	100.00	

(e) $MAPbBr_3$ (from $PbBr_2$salt)





Element	Weight (%)	Atomic (%)
C K	4.31	11.92
O K	31.40	65.18
Si K	1.52	1.80
Ti K	7.71	5.35
Br L	11.45	4.76
Sn L	33.48	9.37
Pb M	10.12	1.62
Totals	100.00	

Fig. S2. Summary of the EDX measurements performed on (a) $PbCl_2$; (b) PbI_2; (c) $PbBr_2$ films and on final $MAPbBr_3$ obtained from (d) $PbCl_2$; (e) PbI_2; (f) $PbBr_2$ original films. For each sample a top view obtained by SEM of the analyzed area, an EDX spectra and a table of the quantified values of the different elements found in the sample is provided. Lead and halide elements are highlighted with yellow color.

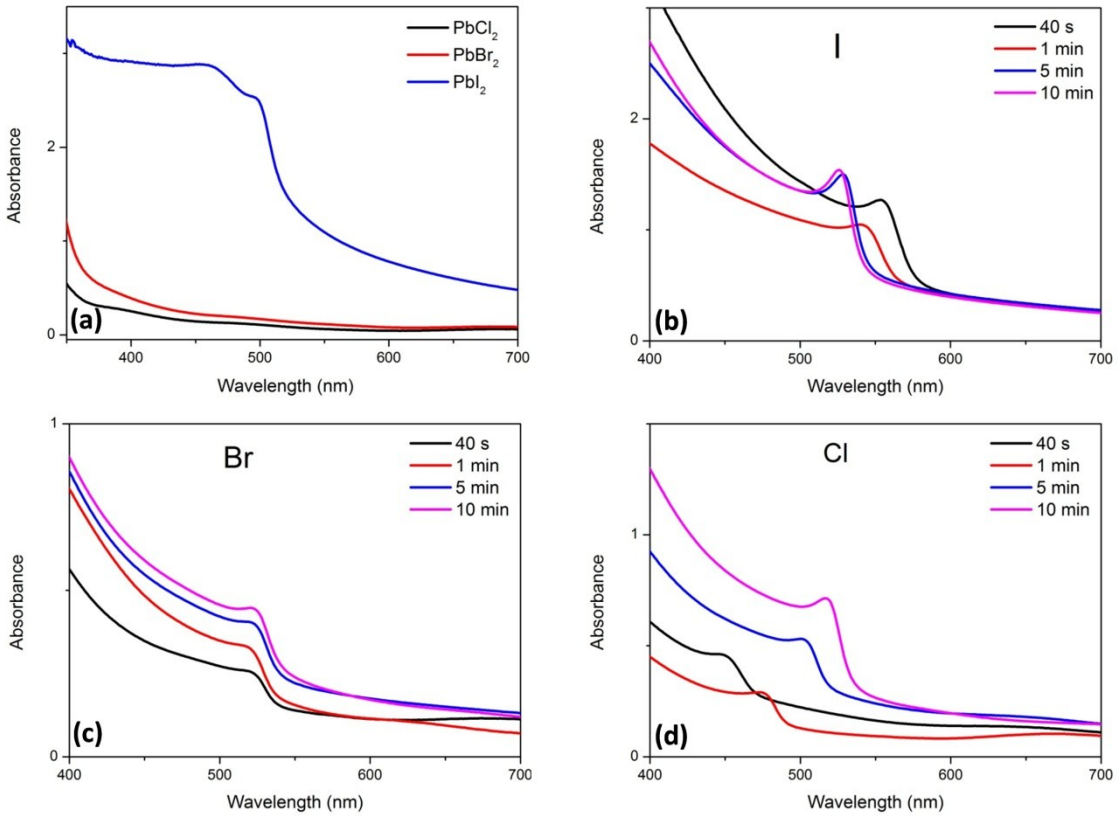


Fig. S3. Light absorption of the different analyzed samples. **(a)**PbX_2layers; and the corresponding evolution after being dipped in a MABr solution at different dipping times starting from a layer of PbI_2**(b)**,$PbBr_2$**(c)**and$PbCl_2$**(d)** salts, respectively.

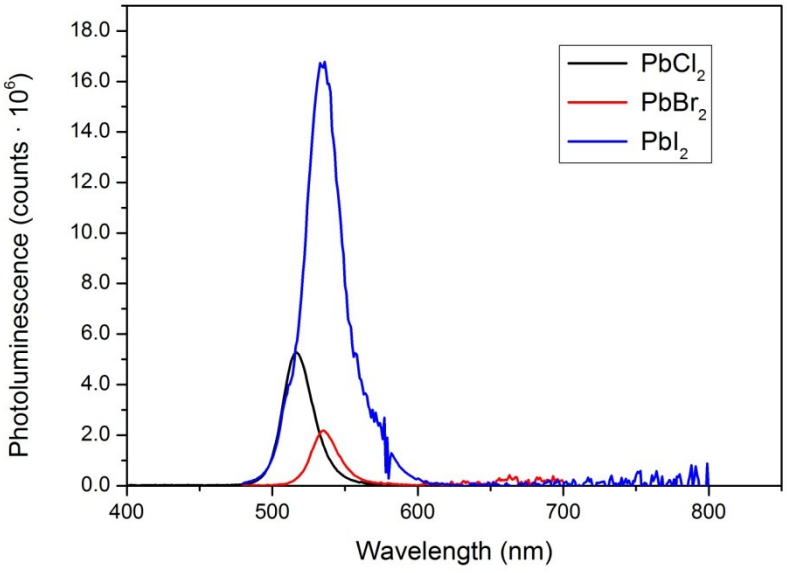


Fig. S4. Normalized photoluminescence spectra of the $MAPbBr_3$ films at different dipping times for the different lead halide precursors PbI_2 , $PbBr_2$ and $PbCl_2$.