Supporting Information

2D and 3D organic/inorganic hybrid perovskites for electrochemical energy storage applications

Febri Baskoro[a], Pin-Chieh Chiang[b], Thuy Thi Bich Tran[b], Hui Qi Wong[b], Afriyanti Sumboja[a], Wanyi Nie[c], Hsinhan Tsai[d,], Hung-Ju Yen[a,*]*

[a] Material Science and Engineering Research Group, Faculty of Mechanical and Aerospace Engineering, Institut Teknologi Bandung, Jl. Ganesha 10, Bandung 40132, Indonesia.
[b] Institute of Chemistry, Academia Sinica, Taipei 115, Taiwan.
[c] Department of Physics, The State University of New York at Buffalo, Buffalo, NY 14260, USA.
[d] Department of Chemical and Biological Engineering, The State University of New York at Buffalo, Buffalo, NY 14260, USA. E-mail: htsai7@buffalo.edu (H.Tsai)

Correspondence: hjyen@gate.sinica.edu.tw (H.-J. Yen); htsai7@buffalo.edu (H.Tsai)

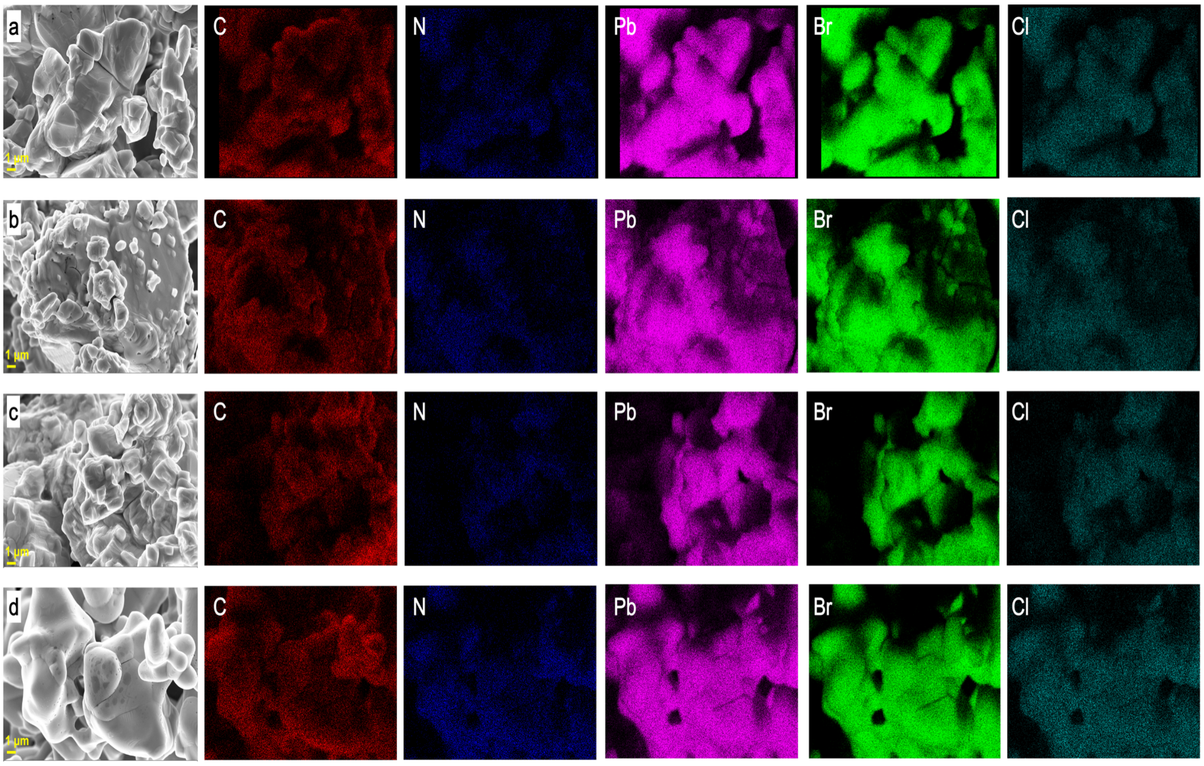

Fig. S1. FESEM/EDS mapping for 3D hybrid perovskites. (a) $MAPbBr_3$-5%Cl prepared by slow evaporation. (b) $MAPbBr_3$-5%Cl prepared by ITC method. (c) MAPbBr3-5%PEACl. (d) $FAPbBr_3$-10%Cl.

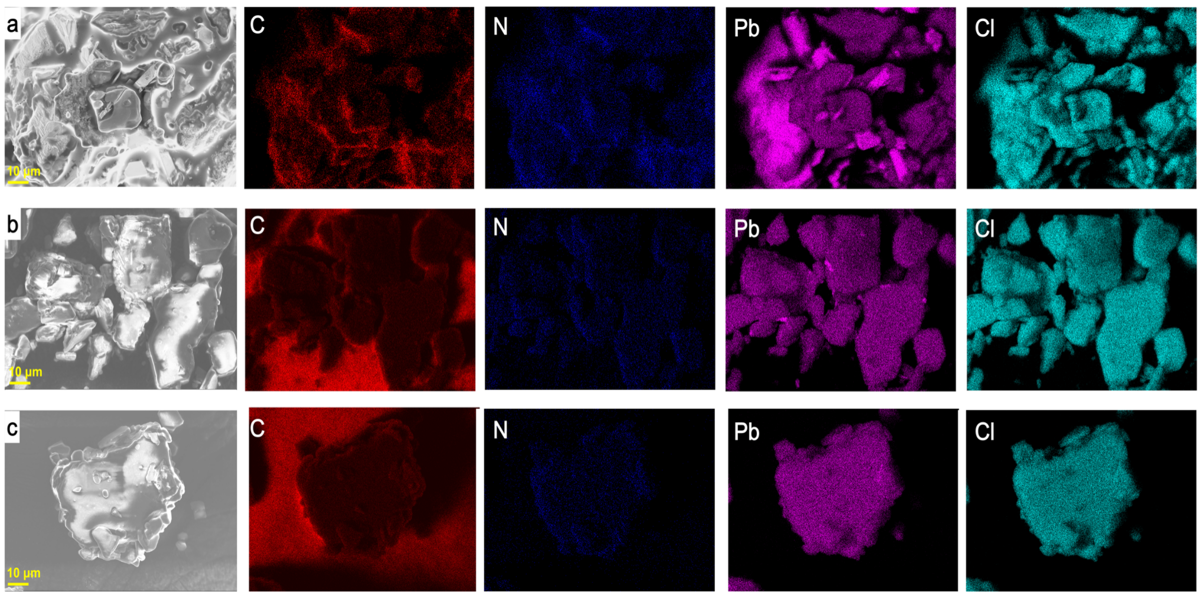

Fig. S2. FESEM/EDS mapping for 2D hybrid perovskites. (a) $BAPbCl_4$. (b) $BZAPbCl_4$. (c) $PEAPbCl_4$.

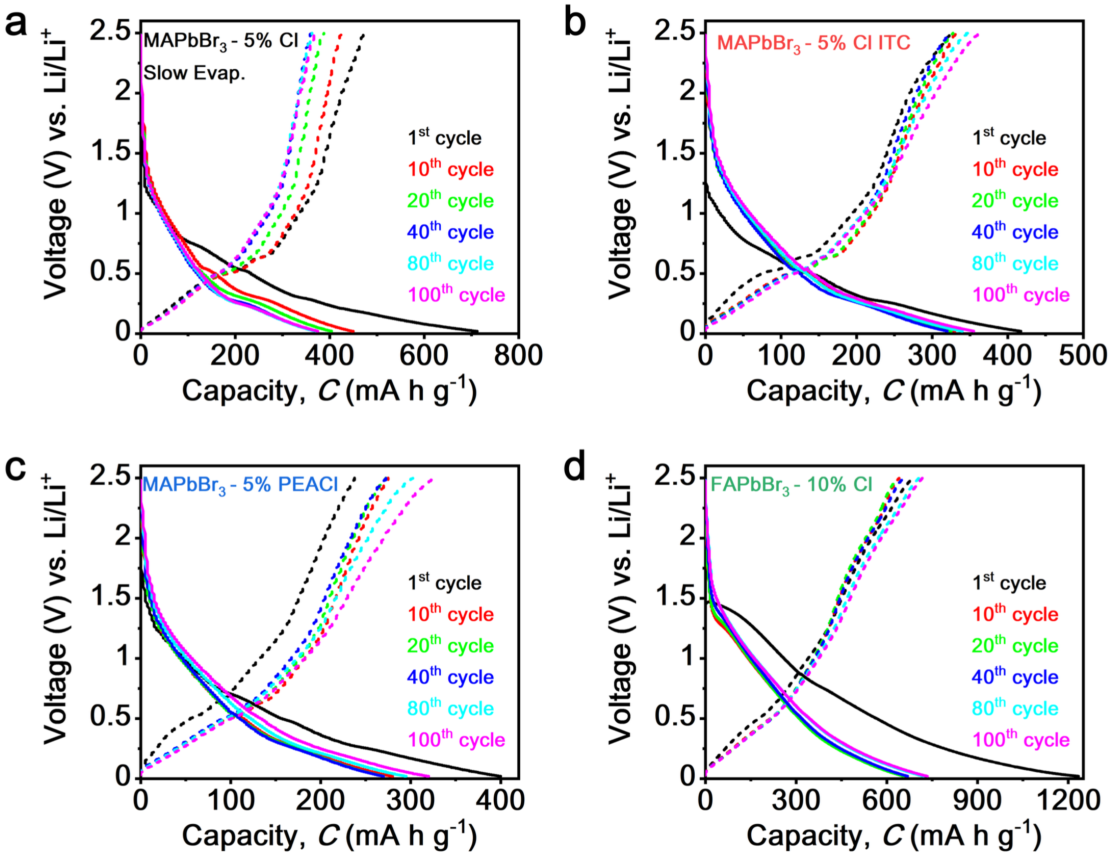

Fig. S3. Galvanostatic profile of 3D hybrid perovskites under 100 mA g^{-1} current density. (a) $MAPbBr_3$-5%Cl prepared by slow evaporation. (b) $MAPbBr_3$-5%Cl prepared by ITC method. (c) $MAPbBr_3$-5%PEACl. (d) $FAPbBr_3$-10%Cl.

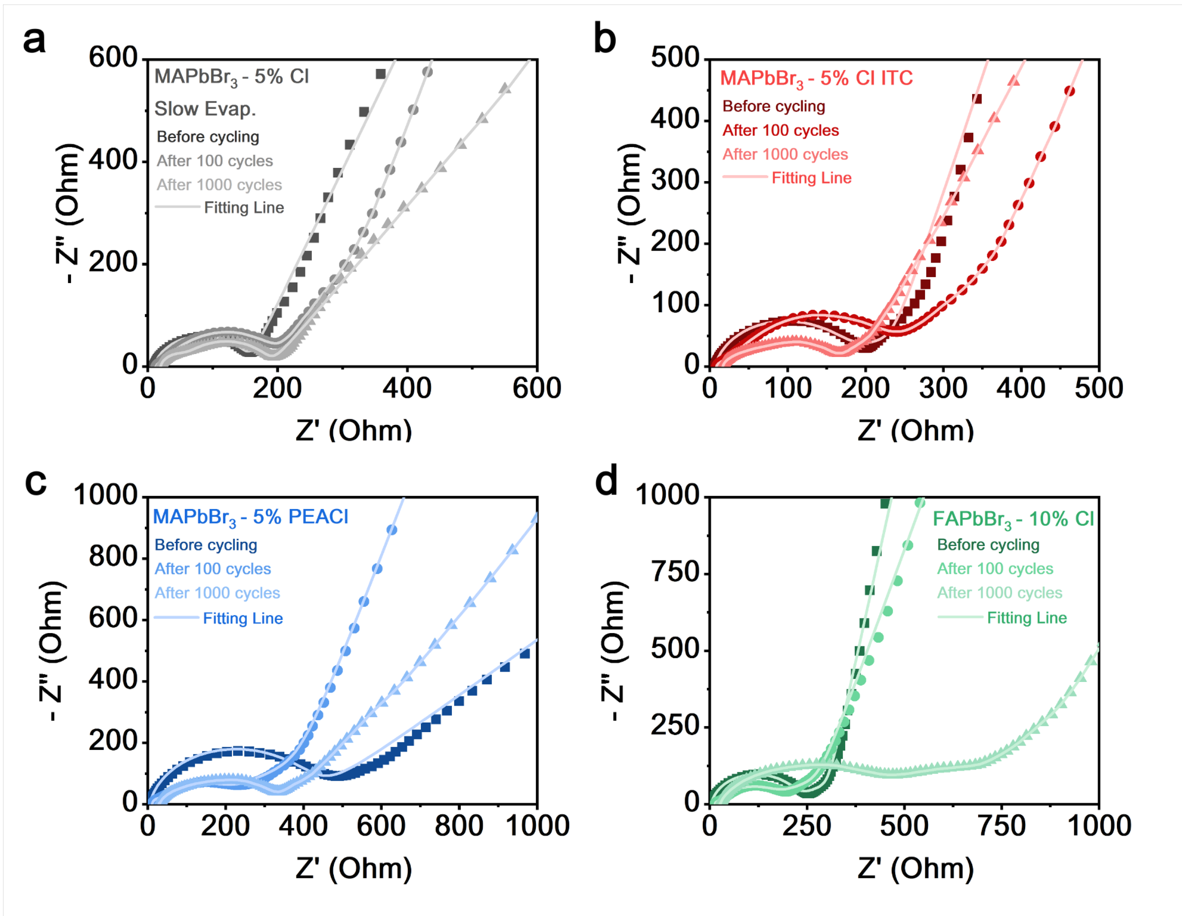

Fig. S4. Nyquist plots of 3D hybrid perovskites EIS data under different cycling stages. (a) $MAPbBr_3$-5%Cl prepared by slow evaporation. (b) $MAPbBr_3$-5%Cl prepared by ITC method. (c) $MAPbBr_3$-5%PEACl. (d) $FAPbBr_3$-10%Cl.

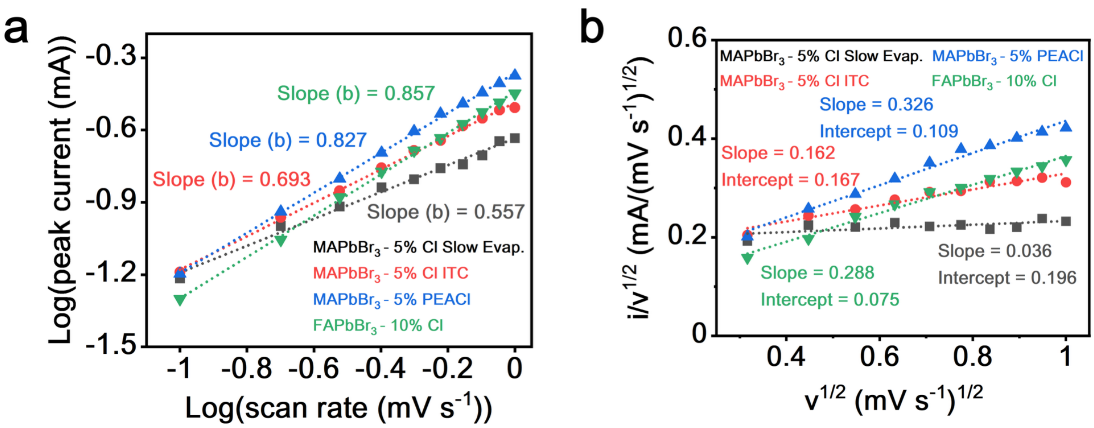

Fig. S5. (a) Log peak current vs log scan rate plot and (b) $v^{1/2}$ vs $i/v^{1/2}$ plot of 3D hybrid perovskites.

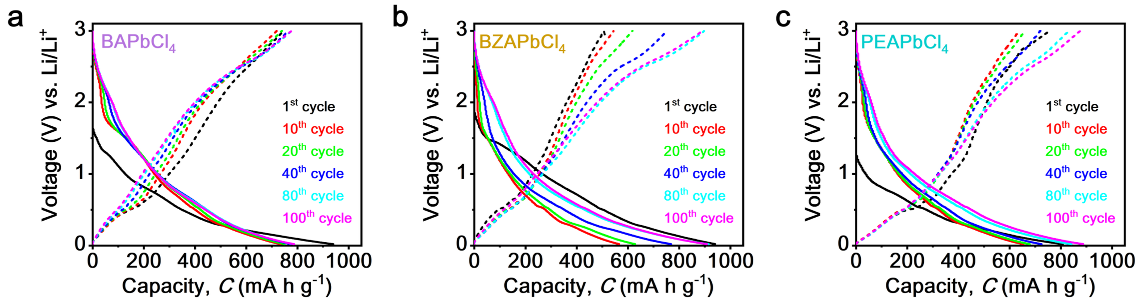

Fig. S6. Galvanostatic profile of 2D hybrid perovskites under 100 mA g^{-1} current density. (a) $BAPbCl_4$. (b) $BZAPbCl_4$. (c) $PEAPbCl_4$.

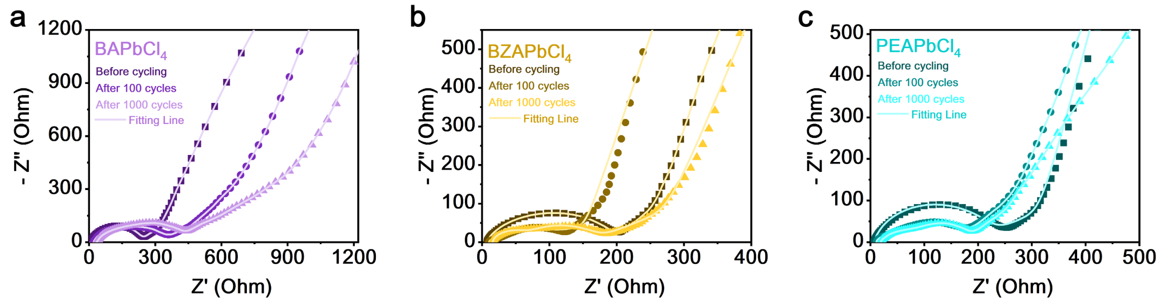

Fig. S7. Nyquist plots of 2D hybrid perovskites EIS data under different cycling stages. (a) $BAPbCl_4$. (b) $BZAPbCl_4$. (c) $PEAPbCl_4$.

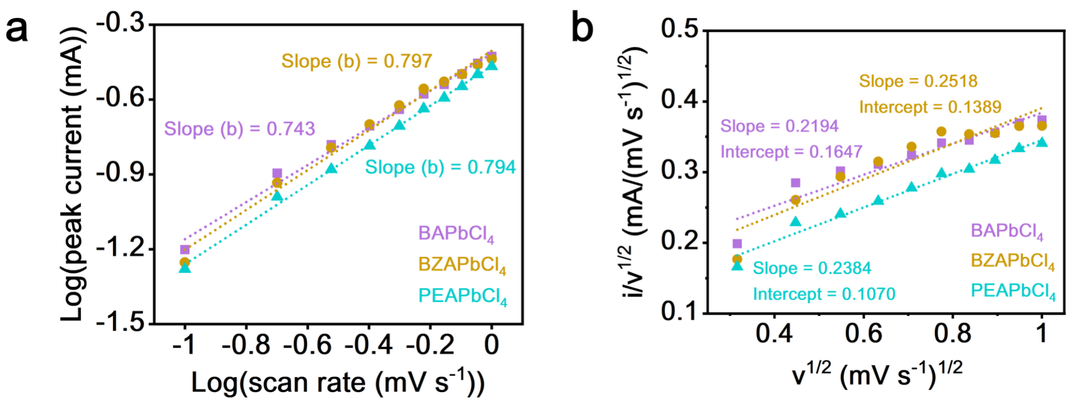

Fig. S8. (a) Log peak current vs log scan rate plot and (b) $v^{1/2}$ vs $i/v^{1/2}$ plot of 2D hybrid perovskites.

Table S1. Fitted data of 3D hybrid perovskites EIS data at different cycling intervals.

	Stages	***Rs*** **(Ω)**	***Rct***$_a$ **(Ω)**	***Rct***$_b$ **(Ω)**	D_{Li} **(cm²/s)**
$MAPbBr_3$–5%Cl Slow evap.	Before cycling	9.502	-	147.7	8.82×10^{-14}
	After 100 cycles	13.17	8.05	141.6	1.54×10^{-13}
	After 1000 cycles	19.65	34.05	136.8	2.24×10^{-12}
$MAPbBr_3$–5%Cl ITC	Before cycling	6.818	-	164.8	1.36×10^{-13}
	After 100 cycles	9.093	13.08	175.2	3.06×10^{-13}
	After 1000 cycles	17.27	30.28	89.42	1.71×10^{-12}
$MAPbBr_3$–5%PEACl	Before cycling	4.425	-	410.5	1.90×10^{-13}
	After 100 cycles	11.15	21.77	155.4	1.92×10^{-13}
	After 1000 cycles	28.7	59.77	248	3.52×10^{-13}
$FAPbBr_3$–10%Cl	Before cycling	3.607	-	215.4	6.22×10^{-13}
	After 100 cycles	13.43	11.71	140.9	9.40×10^{-13}
	After 1000 cycles	26.23	314.8	107	8.82×10^{-13}

Table S2. Fitted data of 2D hybrid perovskites EIS data at different cycling intervals.

	Stages	***Rs*** **(Ω)**	***Rct***$_a$ **(Ω)**	***Rct***$_b$ **(Ω)**	D_{Li} **(cm²/s)**
$BAPbCl_4$	Before cycling	6.291	-	211.4	1.73×10^{-13}
	After 100 cycles	21.39	80.9	203.4	1.27×10^{-12}
	After 1000 cycles	34.8	159.5	188.1	8.38×10^{-13}
$BZAPbCl_4$	Before cycling	7.454	-	169.1	4.67×10^{-13}
	After 100 cycles	10.45	9.146	89.87	2.02×10^{-12}
	After 1000 cycles	15.67	47.77	103.8	1.07×10^{-13}
$PEAPbCl_4$	Before cycling	6.744	-	211.1	4.48×10^{-13}
	After 100 cycles	11.72	18.22	112.3	1.37×10^{-12}
	After 1000 cycles	19.54	39.9	138.2	9.55×10^{-13}

Table S3. Summary of hybrid perovskite anode for Li-ion batteries

Perovskite type	Perovskite name	Open Voltage (V vs Li/Li$^+$)	Current density (mA g^{-1})	Specific capacity (mAh g^{-1})	Ref
All inorganic lead-free perovskite	$La_{0.5}Li_{0.5}TiO_3$	0.01 – 3.0	0.1 C (1C=200 mAg^{-1})	225 (150 cycles)	1
	$Cs_2NaErCl_6$:8Li$^+$	0.1 – 2.5	75	185 (150 cycles)	2
	$[C_3H_5N_2]_3[Bi_2I_9]$ (IMB)	0.01 – 2.5	100	520 (250 cycles)	3
	$[C_2H_4N_3S][BiI_4]$ (ADB)			450 (250 cycles)	
	$[C_3H_5N_2S][BiI_4]$ (ATB)			230 (250 cycles)	
	$Cs_2NaBiCl_6$	0.1 – 2.5	75	300 (20 cycles)	4
	La_2MnNiO_6	0.01 – 3.0	1C (1C= 200 mA g^{-1})	198 (1000 cycles)	5
	$[(Bi,Na)_{1/5}(La,Li)_{1/5}(Ce,K)_{1/5}Ca_{1/5}Sr_{1/5}]TiO_3$	0.01 – 3.0	1000	120.4 (300 cycles)	6
All inorganic lead-based perovskite	$PbTiO_3$	0.01 – 2.5	4.4	200 (70 cycles)	7
	$CsPbBr_3$	-1.0 - +0.5	45	549 (100 cycles)	8
	Cs_4PbBr_6	-0.9 - +0.03	45	283 (100 cycles)	9
Inorganic/organic lead-free perovskite	$(MA)_2CuBr_4$ (2D)	0.01 – 3.0	100 500	630 (140 cycles) 415 (200 cycles)	10
	$(EDBE)[CuCl_4]$	2.1 - 3.2	28	38 (225 cycles)	11
Inorganic/organic lead halide perovskite	$MAPbBr_3$ (3D)	0.01 – 2.5	300	120.1 (200 cycles)	12
	$MAPbBr_3$ (3D)	0.01 – 1.8	50	200 (20 cycles)	13
	$CH_3NH_3PbI_3$ (3D)	0.01 – 2.5	100	202 (50 cycles)	14
	$(C_4H_9NH_3)_2PbI_4$ (2D)			213 (50 cycles)	
	$C_6H_9I_3NOPb$ (1D)			585 (50 cycles)	
	$CH_3NH_3PbBr_3$ (3D)	0.1 – 1.5	200	121 (200 cycles)	15
	$CH_3NH_3PbI_3$ (3D)			34.6 (100 cycles)	
	$MAPbBr_3$-5%Cl slow evap. (3D)	0.01 – 2.5	100	352 (100 cycles)	**This**

			500	338.8 (1000 cycles)	**work**
	MAPbBr$_3$-5%Cl ITC (3D)		100	349.6 (100 cycles)	
			500	347.1 (1000 cycles)	
	MAPbBr$_3$-5%PEACl (3D)		100	332 (100 cycles)	
			500	229 (1000 cycles)	
	FAPbBr$_3$-10%Cl (3D)		100	523.8 (100 cycles)	
			500	324.7 (1000 cycles)	
	BAPbCl$_4$ (2D)		100	679.4 (100 cycles)	
			500	250 (1000 cycles)	
	BZAPbCl$_4$ (2D)		100	1008.3 (100 cycles)	
			500	181.3 (1000 cycles)	
	PEAPbCl$_4$ (2D)		100	874 (100 cycles)	
			500	146.9 (1000 cycles)	

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