

Supporting Information

Air-stable Double Halide Perovskite $\text{Cs}_2\text{CuBiBr}_6$: Synthesis and Memristor Application

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Device Structure:

For the Resistive memory device application, the fabricated device consists of a layer of ITO, Double perovskite, and the metal electrode Aluminium. The schematic device structure is shown in Figure S1.

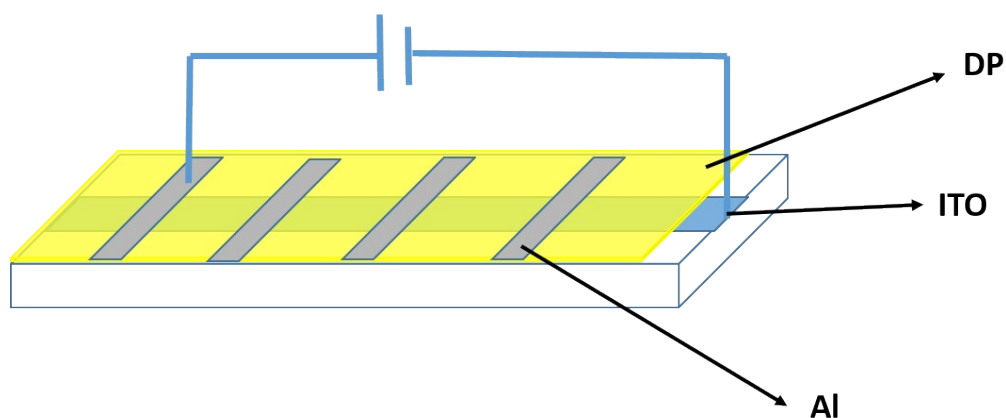


Figure S1: The schematic diagram of the fabricated device

Characterizations:

The XPS characterization shows the full range spectrum of binding energy from 0 to 1200 eV in Figure S2(a), where all the peaks of the elements present in this double perovskite material are indicated. Figure S2(b)-(c) shows some FESEM images of the drop casted samples.

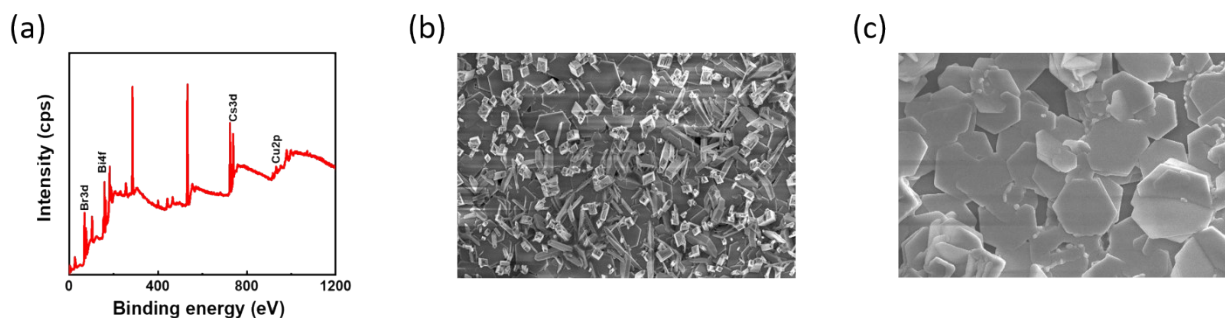


Figure S2: (a) The XPS spectra of the DP with a range from 0 to 1200 eV, (b)-(c). Some FESEM images of the material with scale 2 and 5 μm, respectively.

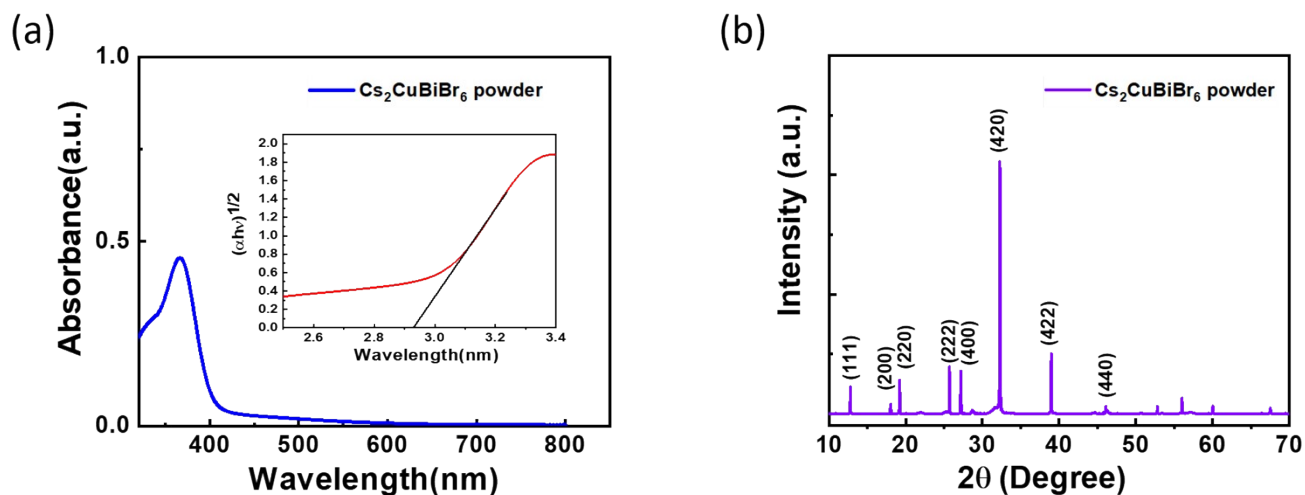


Figure S3: (a) The UV-Vis spectra and (b) XRD of the DP after one month in ambient condition.

Table ST 1: Comparison of different DP and their lattice constant, Ionic radii, bond lengths, and tolerance factors.

	Double perovskite material	Optimized lattice parameter (Å)	Ionic radii (Å)	Bond length (Å)	Tolerance factor

	$A_2BB'X_6$	a	r_A	r_B	$r_{B'}$	$B-X$	$B'-X$	t	t'
1	$Cs_2AgBiBr_6$	11.639	1.88	1.15	1.03	2.900	2.919	0.890	3.962
2	$Cs_2AgBiCl_6$	10.964	1.88	1.15	1.03	2.746	2.736	0.900	3.825
3	* Cs_2AgBiI_6	12.415	1.88	1.15	1.03	3.066	3.142	0.877	4.183
4	$Cs_2AgSbBr_6$	11.379	1.88	1.15	0.76	2.862	2.827	0.932	3.959
5	$Cs_2AgSbCl_6$	10.923	1.88	1.15	0.76	2.770	2.691	0.944	3.802
6	* Cs_2AgSbI_6	12.138	1.88	1.15	0.76	3.026	3.044	0.915	4.21
7	$Cs_2AgTlBr_6$	11.980	1.88	1.15	0.885	2.926	3.064	0.912	3.936
8	$Cs_2AgTlCl_6$	11.247	1.88	1.15	0.885	2.790	2.833	0.923	3.788
9	Cs_2AgTlI_6	10.845	1.88	1.15	0.885	2.734	2.688	0.897	4.172
10	$Cs_2AuBiBr_6$	11.531	1.88	1.37	1.03	2.853	2.911	0.859	4.123
11	$Cs_2AuBiCl_6$	10.939	1.88	1.37	1.03	2.732	2.738	0.867	3.998
12	* Cs_2AuBiI_6	12.277	1.88	1.37	1.03	3.006	3.133	0.849	4.323
13	$Cs_2AuSbBr_6$	11.352	1.88	1.37	0.76	2.837	2.839	0.898	3.947
14	$Cs_2AuSbCl_6$	10.822	1.88	1.37	0.76	2.735	2.676	0.908	3.806
15	Cs_2AuSbI_6	11.980	1.88	1.37	0.76	2.960	3.029	0.884	4.172
16	$Cs_2AuTlBr_6$	11.268	1.88	1.37	0.885	2.722	2.912	0.880	4.000
17	$Cs_2AuTlCl_6$	10.800	1.88	1.37	0.885	2.598	2.802	0.888	3.867
18	* Cs_2AuTlI_6	12.140	1.88	1.37	0.885	2.907	3.163	0.867	4.213
20	$Cs_2CuBiCl_6$	10.770	1.88	0.77	1.03	2.692	2.663	0.963	3.847
21	* Cs_2CuBiI_6	12.128	1.88	0.77	1.03	2.871	3.114	0.931	4.280
22	* $Cs_2CuSbBr_6$	11.216	1.88	0.77	0.76	2.689	2.850	0.997	4.296
23	$Cs_2CuSbCl_6$	10.648	1.88	0.77	0.76	2.555	2.699	1.013	4.099
24	* Cs_2CuSbI_6	12.016	1.88	0.77	0.76	2.870	3.060	0.973	4.609
25	$Cs_2CuTlBr_6$	11.216	1.88	0.77	0.885	2.804	2.775	0.974	4.137
26	$Cs_2CuTlCl_6$	10.638	1.88	0.77	0.885	2.659	2.632	0.989	3.956
27	* Cs_2CuTlI_6	11.910	1.88	0.77	0.885	2.623	2.914	0.953	4.427
19	$Cs_2CuBiBr_6$ This Work	11.18	1.88	0.77	1.03	2.615	2.890	0.950	4.014

* indicates the materials which do not satisfy stable perovskite criterion $t' < 4.18$.

Table ST1: The optimized lattice parameter, ionic radii of the constituent ions, bond lengths along with Goldschmidt tolerance factor (t) and Modified tolerance factor (t') for $Cs_2BB'X_6$ (B-: Ag/Au/Cu, B'-: Bi/Sb/Tl and X-: Br/Cl/I) systems.