All-inorganic tin-doped $Cs_2BiAgCl_6$ double perovskite with stability blue photoluminescence WLEDs

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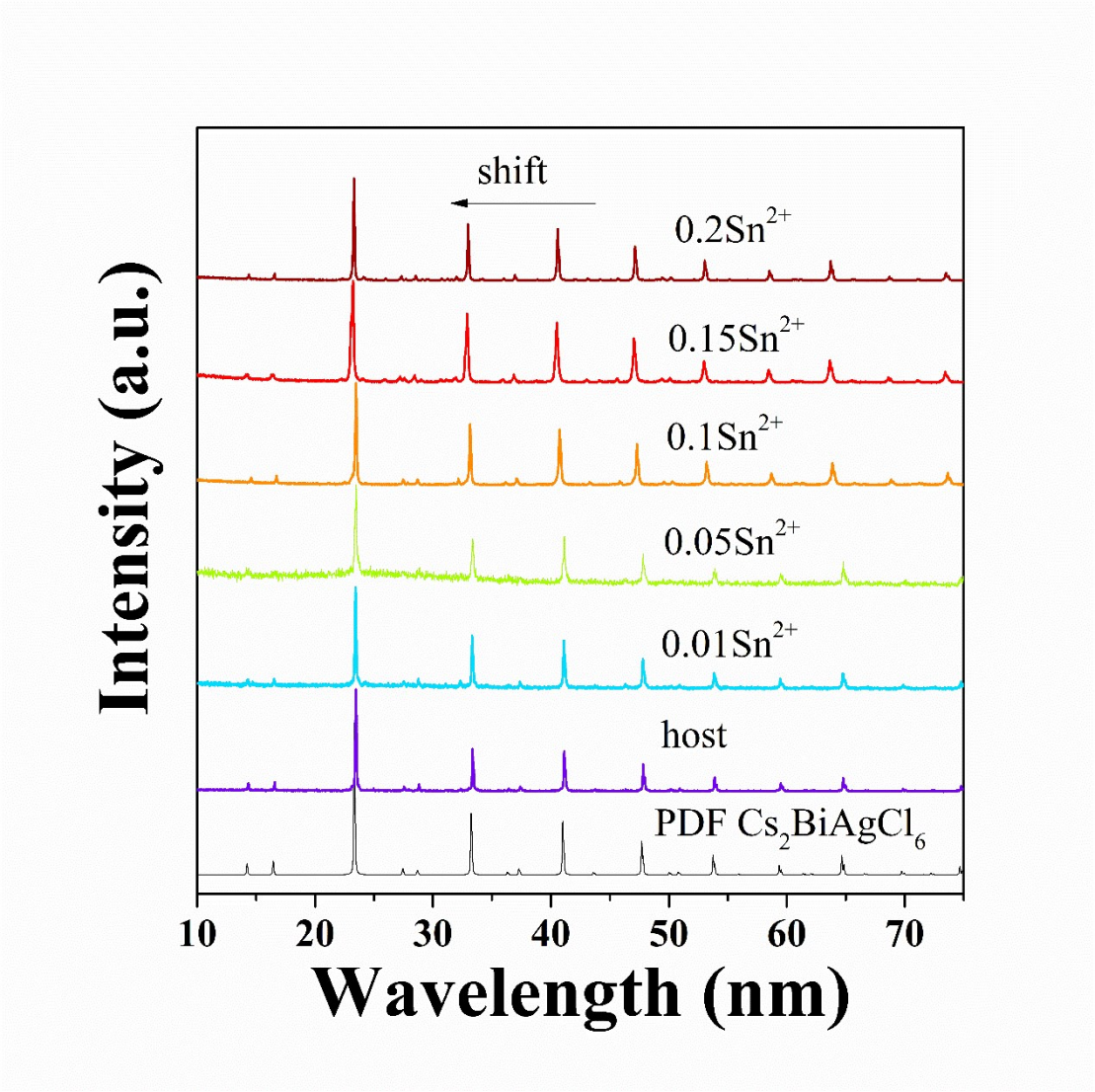

Figure S1. PXRD patterns of the Sn-doped and pristine $Cs_2BiAgCl_6$.

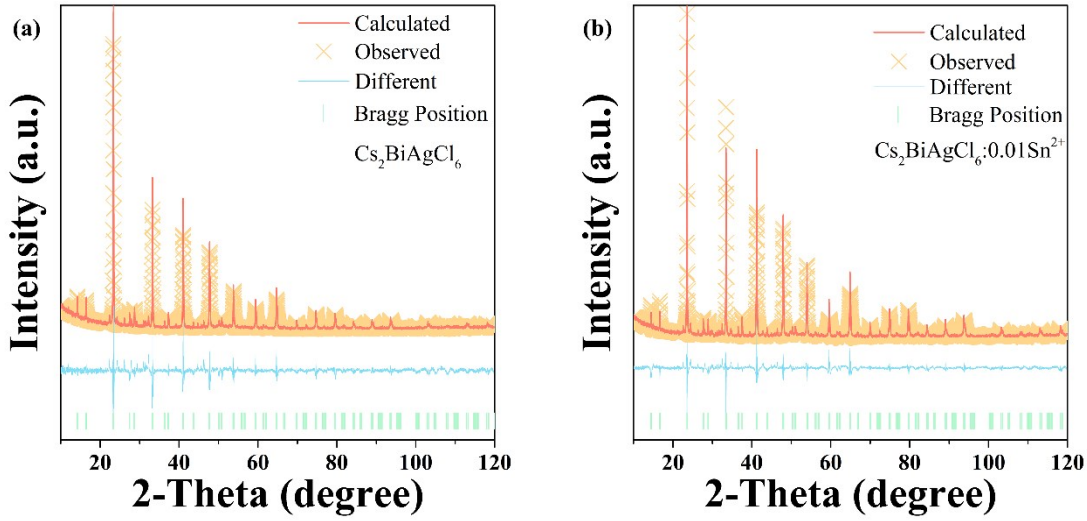

Figure S2. The Rietveld refinement of the host and representative $Cs_2BiAgCl_6$:0.01Sn^{2+}.

Table S1. Main parameters of processing and refinement of the $Cs_2BiAgCl_6$:$x$$Sn^{2+}$ samples.

x	*a=b=c (Å)*	*V (Å³)*	R_{wp} *(%)*	R_p *(%)*
standard	10.777	1251.68		
0	10.771	1249.592	4.63	3.76
0.1	10.784	1254.240	5.76	4.53

Table S2. Selected interatomic distances in samples.

Bond	Length (Å)	Optr. Cell	Neighbor atom coordinates
		$x = 0$	
Cl-Cs	3.81403(4)	9 0 0 0	0.25000 -0.25000 -0.25000
Cl-Bi	2.57586(4)	1 0 0 0	0.00000 0.00000 0.00000
Cl-Ag	2.81533(4)	101 0-1-1	0.50000 0.00000 0.00000
		$x = 0.1$	
Cl-Cs	3.81304(7)	9 0 0 0	0.25000 -0.25000 -0.25000
Cl-Bi	2.65677(7)	1 0 0 0	0.00000 0.00000 0.00000
Cl-Ag	2.73541(8)	101 0-1-1	0.50000 0.00000 0.00000

Table S3. Fractional atomic coordinates and isotropic displacement parameters in samples.

$x = 0$	frac.	x	y	z	$100*U_{iso}$
Cs^{+}	1.015	0.25	0.25	0.25	3.983
Bi^{3+}	0.983	0.00	0.00	0.00	2.107
Ag^{+}	1.016	0.50	0.50	0.50	2.413
Cl^{-}	1.000	0.24	0.00	0.00	3.709
$x = 0.1$	frac.	x	y	z	$100*U_{iso}$
Cs^{+}	1.025	0.25	0.25	0.25	4.025
Bi^{3+}	1.051	0.00	0.00	0.00	2.257
Ag^{+}	1.152	0.50	0.50	0.50	2.543
Cl^{-}	1.176	0.24	0.00	0.00	3.820

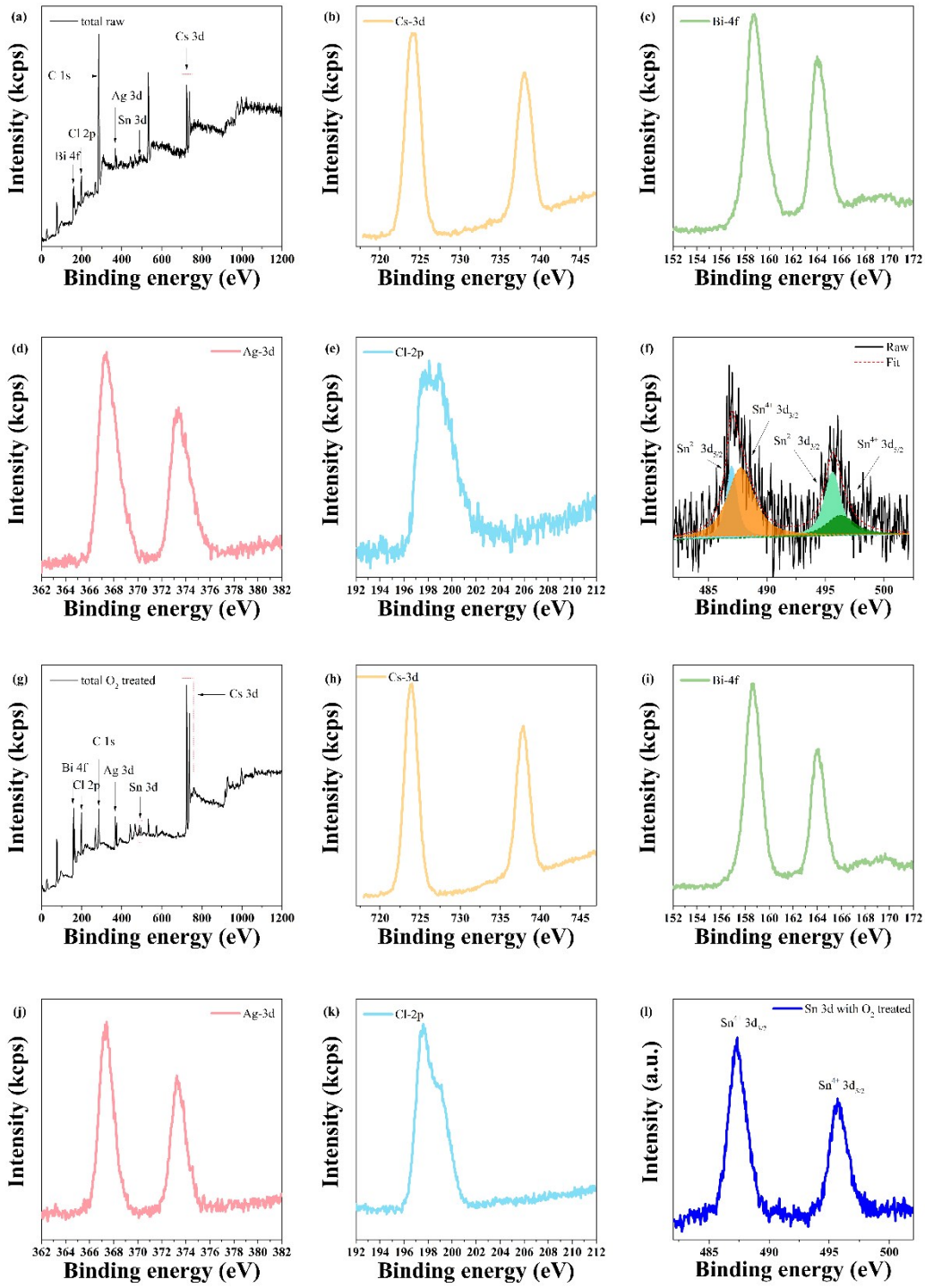

Figure S3. XPS spectra corresponding to (a) raw total, (b) raw Cs 3d, (c) raw Bi 4f, (d) raw Ag 3d, (e) raw Cl 2p, (f) raw Sn 3d, (g) O_2 treated total, (h) O_2 treated Cs 3d, (i) O_2 treated Bi 4f, (j) O_2 treated Ag 3d, (k) O_2 treated Cl 2p, (l) O_2 treated Sn 3d.

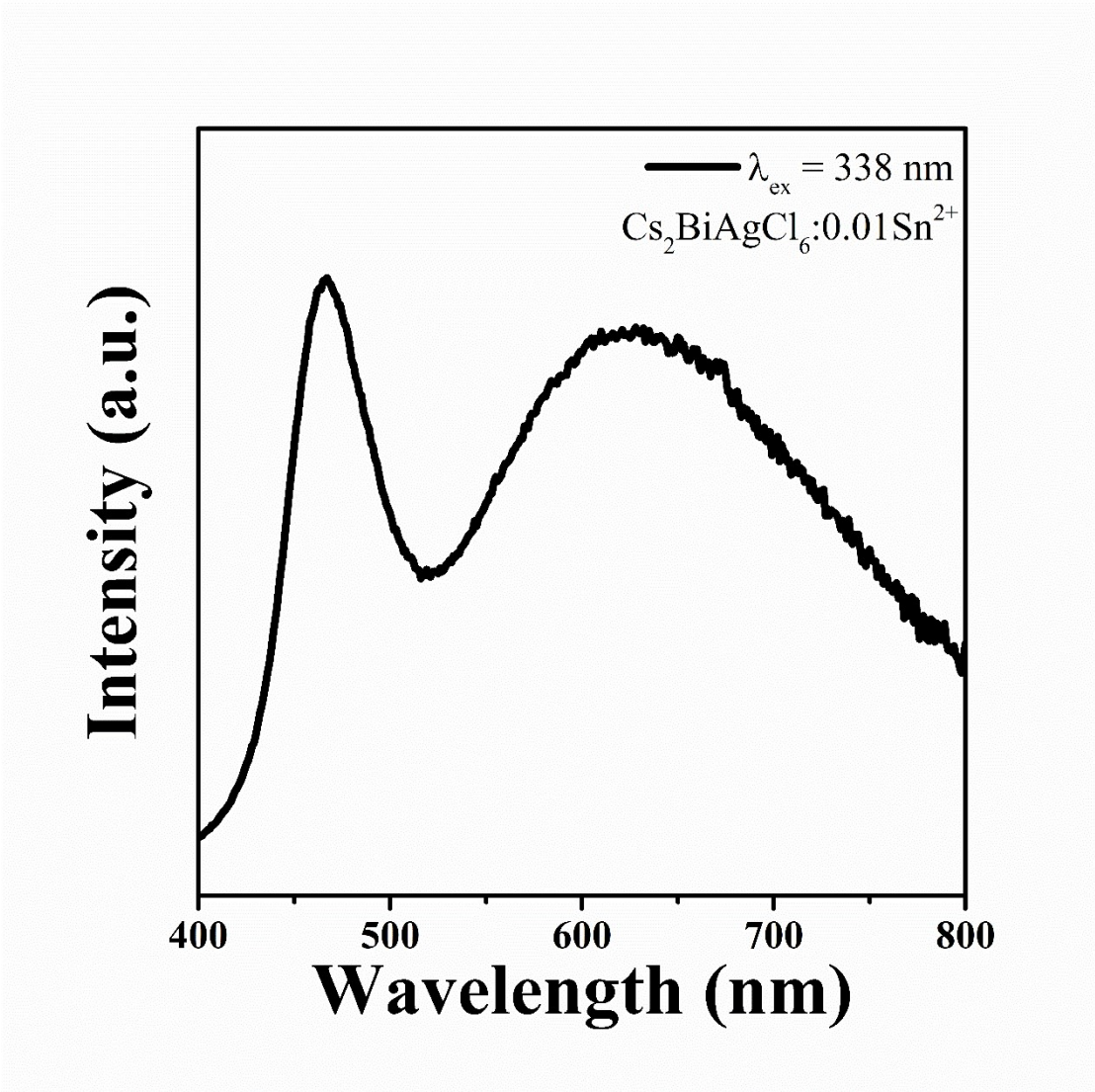

Figure S4. PL for $Cs_2BiAgCl_6:0.01Sn^{2+}$.

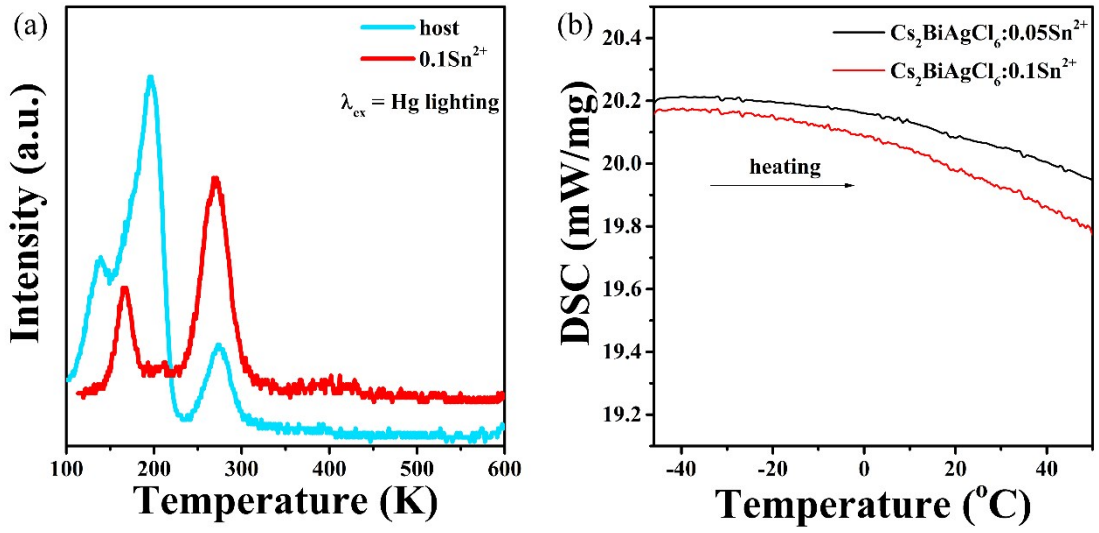

Figure S5. (a) TL for $Cs_2BiAgCl_6$:0.1Sn^{2+}, (b) Differential scanning calorimetry (DSC) curves of pristine $Cs_2BiAgCl_6$:*x*Sn^{2+} in heating progress.

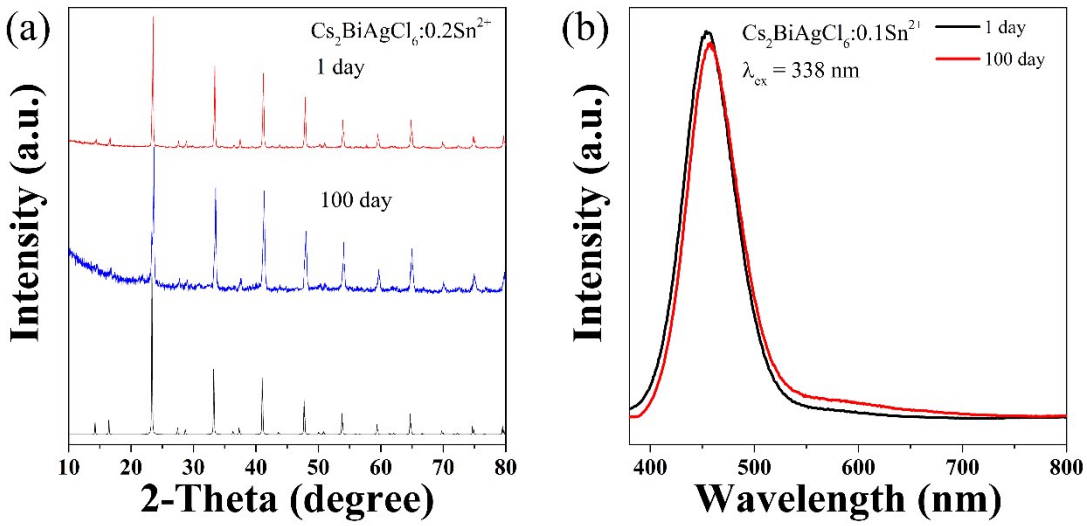

Figure S6. (a) XRD of pristine and $Cs_2BiAgCl_6$:0.2Sn^{2+} after being exposed to air for 100 days, (b) PL intensity of pristine and $Cs_2BiAgCl_6$:0.1Sn^{2+} after being exposed to air for 100 days.