

## ***Electronic Supplementary Information (ESI)***

### **Improved Ultraviolet Radiation Stability of Mn<sup>2+</sup> Doped CsPbCl<sub>3</sub> Nanocrystals via B-site Sn Doping**

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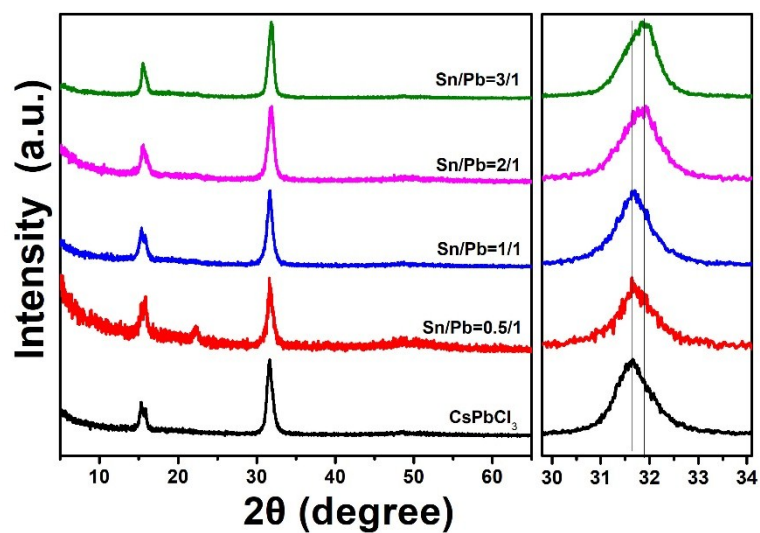
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**Fig. S1** XRD patterns of CsPbCl<sub>3</sub> NCs synthesized with various Sn /Pb ratios. An enlarged view of the peaks marked by the outline is shown in the right panel, in which the vertical lines are drawn to guide the eye. It is found that the diffraction peak near 32 degree shifts to a large angle with increasing Sn content, indicating that increased Sn<sup>2+</sup> ions are doped in the NCs.

### *PL decay fitting details*

The lifetime data were fitted by a biexponential function:

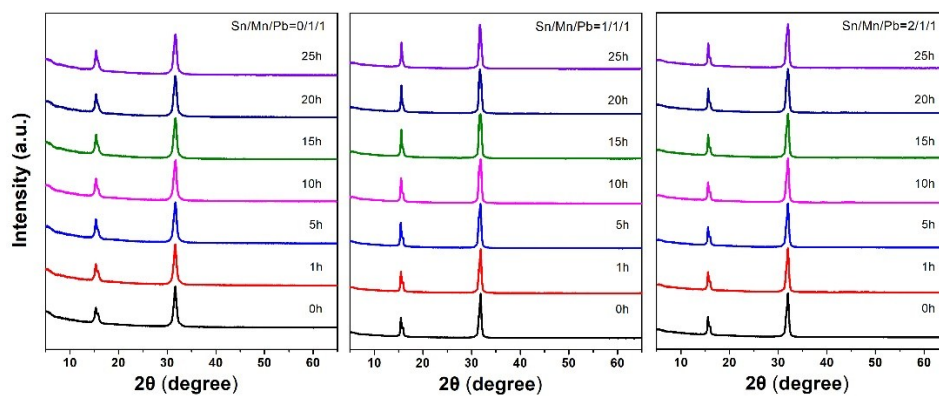
$$I(t) = A_1 \exp(-t/\tau_1) + A_2 \exp(-t/\tau_2) \dots\dots\dots(1)$$

where  $\tau_1$  and  $\tau_2$  are the time constants, respectively,  $A_1$  and  $A_2$  are the normalized amplitudes of the components, respectively. The average lifetime was given by:

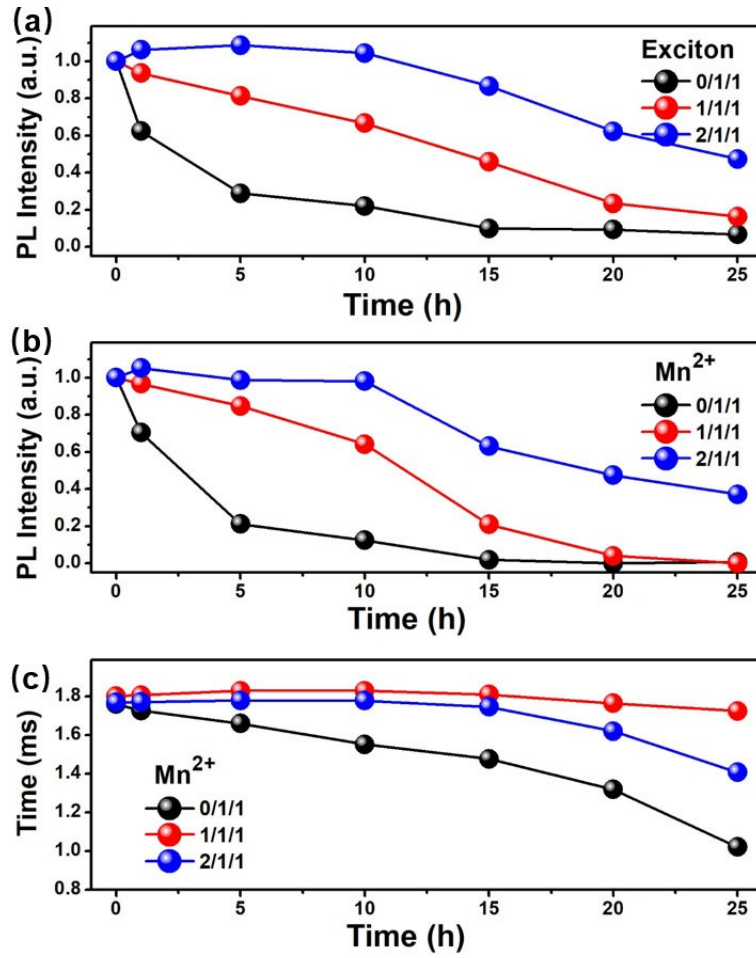
$$\tau_{ave} = (A_1\tau_1^2 + A_2\tau_2^2)/(A_1\tau_1 + A_2\tau_2) \dots\dots\dots(2)$$

**Table S1.** Mn<sup>2+</sup> PL decay parameters of Mn:CsPbCl<sub>3</sub> NCs synthesized with various Sn/Mn/Pb ratios.

Sn/Mn/Pb ratios	Fitting parameters				$\tau_{avg}$ (ms)
	A <sub>1</sub>	$\tau_1$ (ms)	A <sub>2</sub>	$\tau_2$ (ms)	
0/1/1	0.04	0.14	0.96	1.75	1.74
0.5/1/1	0.15	0.16	0.93	1.78	1.76
1/1/1	0.02	0.03	0.98	1.8	1.80
2/1/1	0.05	0.19	0.95	1.78	1.77
3/1/1	0.06	0.23	0.94	1.75	1.73



**Fig. S2** XRD patterns of Mn:CsPbCl<sub>3</sub> NCs with Sn/Mn/Pb molar ratios of 0/1/1, 1/1/1, and 2/1/1 under ultraviolet illumination at various times. No significant change was observed in all samples, indicating that the optical degradation of these NCs did not originate directly from its structural degradation.



**Fig. S3** PL intensities of band-edge excitons (a) and Mn<sup>2+</sup> ions (b) and PL lifetimes of Mn<sup>2+</sup> ions in the Mn:CsPbCl<sub>3</sub> NCs as a function of illumination time. The PL intensities are normalized for their initial samples without ultraviolet illumination.

**Table S2.** Mn<sup>2+</sup> PL decay parameters of Mn:CsPbCl<sub>3</sub> NCs with Sn/Mn/Pb ratio of 0/1/1 under ultraviolet illumination at various times.

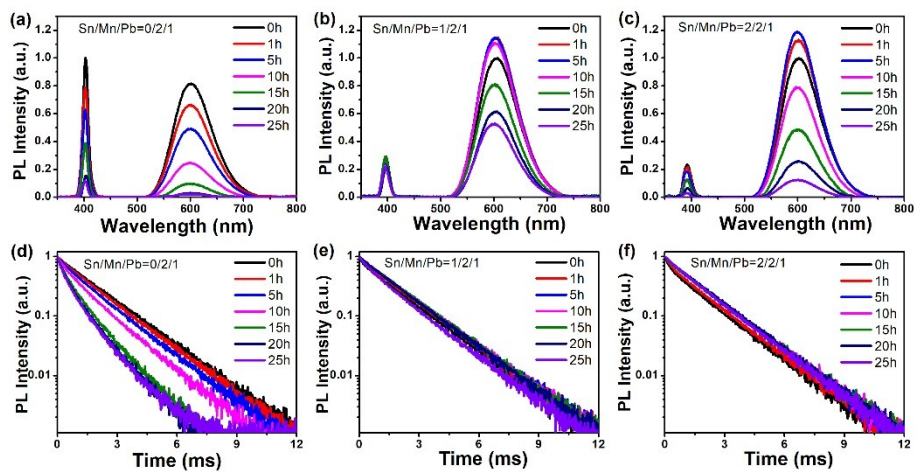
Sn/Mn/Pb=0/1/1	Fitting parameters				$\tau_{\text{avg}}$ (ms)
	A <sub>1</sub>	$\tau_1$ (ms)	A <sub>2</sub>	$\tau_2$ (ms)	
0h	0.49	1.76	0.49	1.76	1.76
1h	0.94	1.76	0.08	1.08	1.73
5h	0.08	0.39	0.91	1.69	1.66
10h	0.82	1.61	0.17	0.41	1.55
15h	0.20	0.39	0.79	1.55	1.48
20h	0.25	0.36	0.75	1.40	1.32
25h	0.32	0.33	0.68	1.12	1.02

**Table S3.** Mn<sup>2+</sup> PL decay parameters of Mn:CsPbCl<sub>3</sub> NCs with Sn/Mn/Pb ratio of 1/1/1 under ultraviolet illumination at various times.

Sn/Mn/Pb=1/1/1	Fitting parameters				$\tau_{\text{avg}}$ (ms)
	A <sub>1</sub>	$\tau_1$ (ms)	A <sub>2</sub>	$\tau_2$ (ms)	
0h	0.50	1.80	0.50	1.80	1.80
1h	0.50	1.81	0.50	1.81	1.81
5h	0.50	1.83	0.50	1.83	1.83
10h	0.50	1.83	0.50	1.83	1.83
15h	0.50	1.81	0.50	1.81	1.81
20h	0.50	1.76	0.50	1.76	1.76
25h	0.09	0.64	0.91	1.76	1.73

**Table S4.** Mn<sup>2+</sup> PL decay parameters of Mn:CsPbCl<sub>3</sub> NCs with Sn/Mn/Pb ratio of 2/1/1 under ultraviolet illumination at various times.

Sn/Mn/Pb=2/1/1	Fitting parameters				$\tau_{\text{avg}}$ (ms)
	A <sub>1</sub>	$\tau_1$ (ms)	A <sub>2</sub>	$\tau_2$ (ms)	
0h	0.95	1.78	0.05	0.19	1.77
1h	0.50	1.77	0.50	1.77	1.77
5h	0.01	0.23	0.99	1.78	1.78
10h	0.01	0.58	0.99	1.78	1.78
15h	0.03	0.08	0.97	1.75	1.75
20h	0.14	0.49	0.86	1.67	1.62
25h	0.24	0.50	0.76	1.50	1.41



**Fig. S4** PL spectra and  $\text{Mn}^{2+}$  emission decay curves of  $\text{Mn}:\text{CsPbCl}_3$  NCs with Sn/Mn/Pb molar ratios of 0/2/1 (a, d), 1/2/1 (b, e), and 2/2/1 (c, f) under ultraviolet illumination at various times.