Supporting Information

Bright Self-Trapped Exciton Emission in Alkali Iodide Nanocrystals via Sn(II)-Doping

Xuemeng Wang[1], Zan Dou[1], Cong Tao[1], Gaoyu Chen[1], Qi Wei[2], Haoyu You[3], Xiao wang Liu[1], Yatao Zou[1], Nannan Han[1], Weidong Xu[1*]

Frontiers Science Center for Flexible Electronics, Xi'an Institute of Flexible Electronics (IFE), Northwestern Polytechnical University127, West Youyi Road, Xi'an 710072, China

Corresponding Authors

*ifewdxu@nwpu.edu.cn

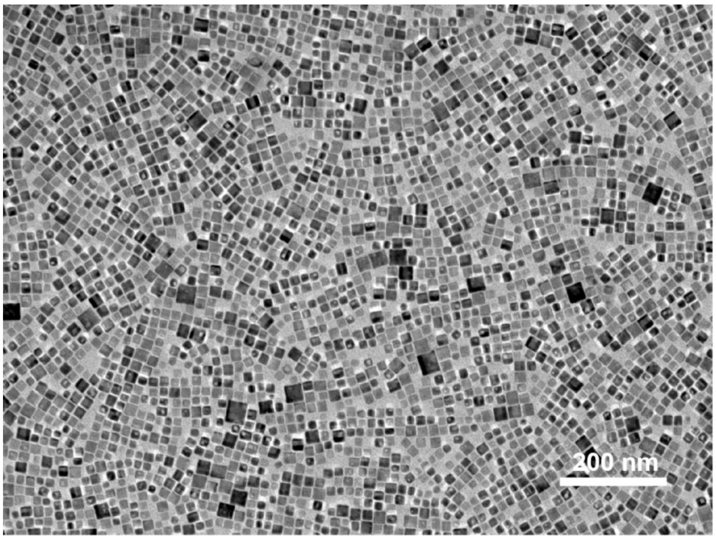

Figure S1 TEM image of RbI NCs

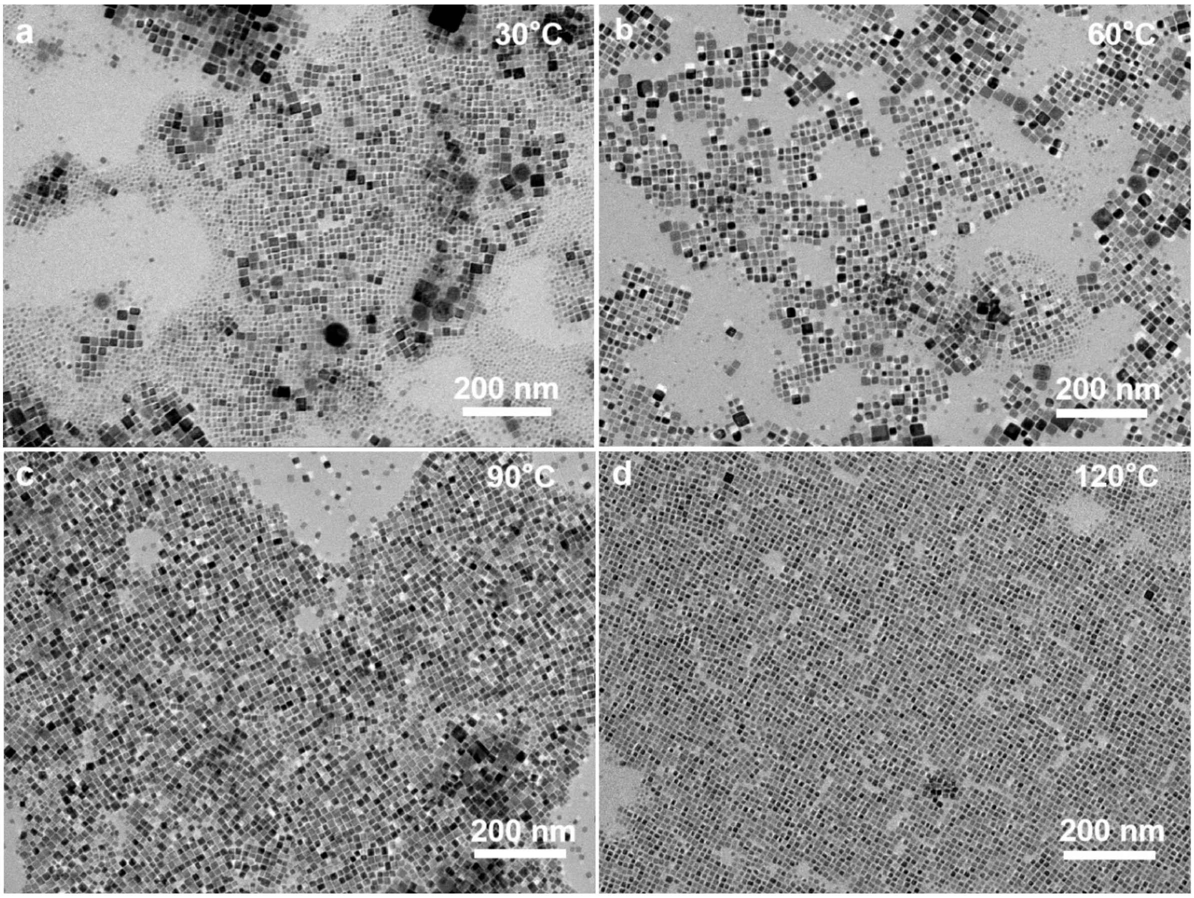

Figure S2 TEM images of Sn^{2+}-doped RbI NCs synthesized at different injection temperatures.

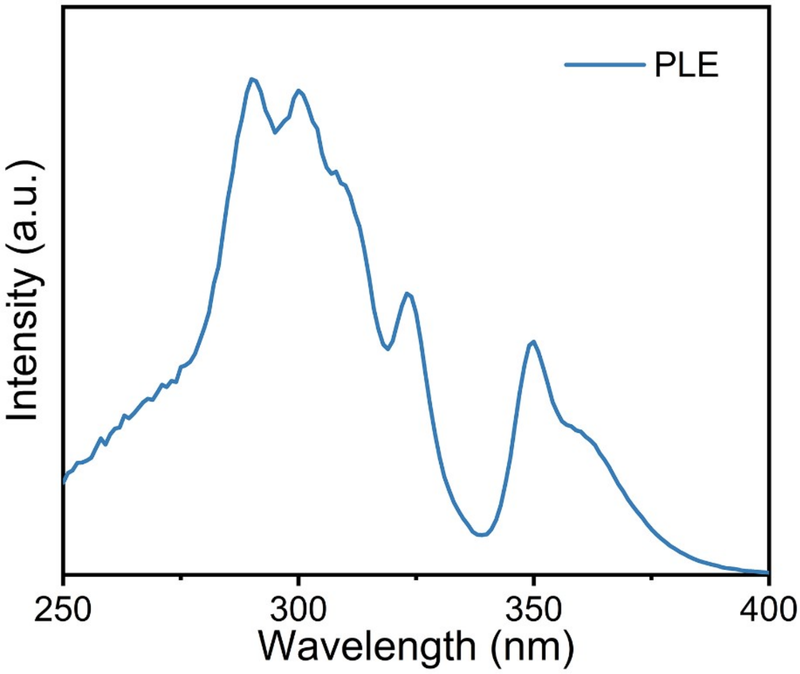

Figure S3 PL excitation spectra of Sn^{2+}-doped RbI NCs.

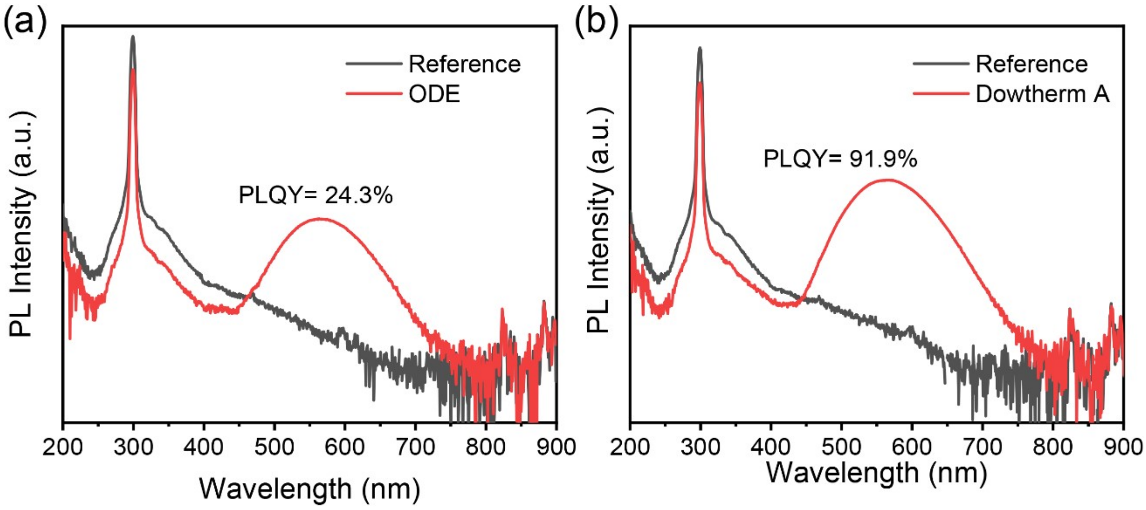

Figure S4 The PLQY of Sn^{2+}-doped RbI NCs synthesized by ODE (a) and Dowtherm A (b) as a solvent.

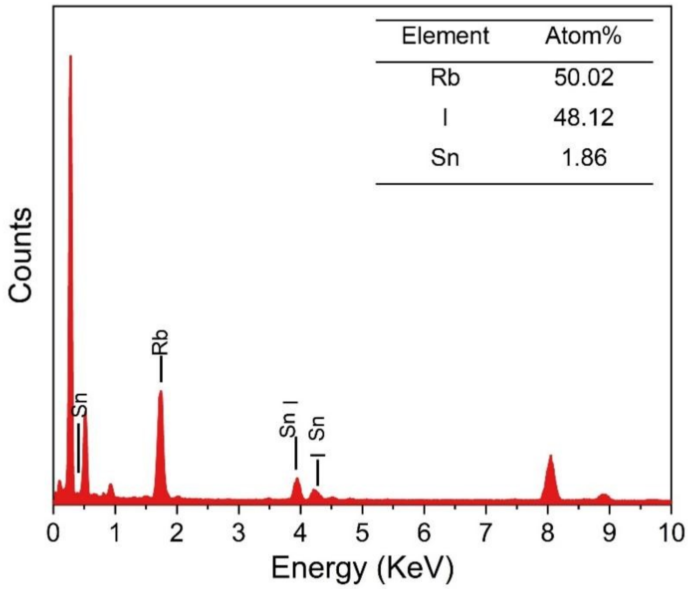

Figure S5 HRTEM EDS of Sn^{2+}-doped RbI NCs.

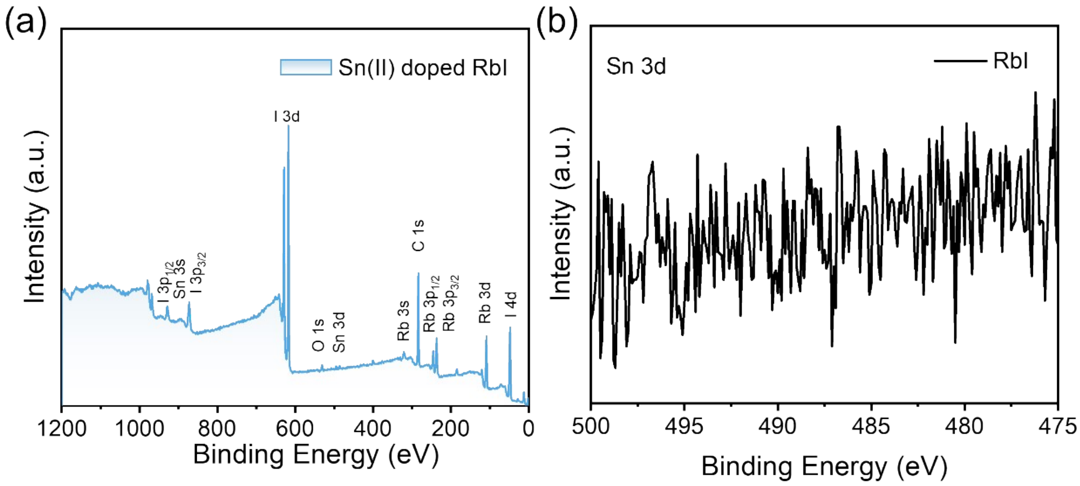

Figure S6 (a) XPS survey spectra of Sn^{2+}-doped RbI NCs. (b) Sn 3d core level spectra for RbI NCs without Sn^{2+} doping.

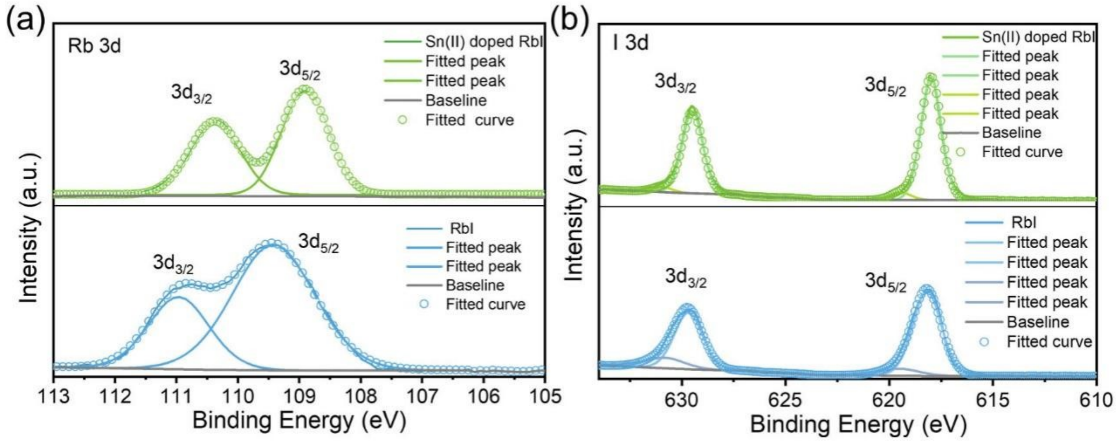

Figure S7 XPS spectra corresponding to Sn^{2+}-doped RbI NCs of Rb 3d (a) and I 3d (b).

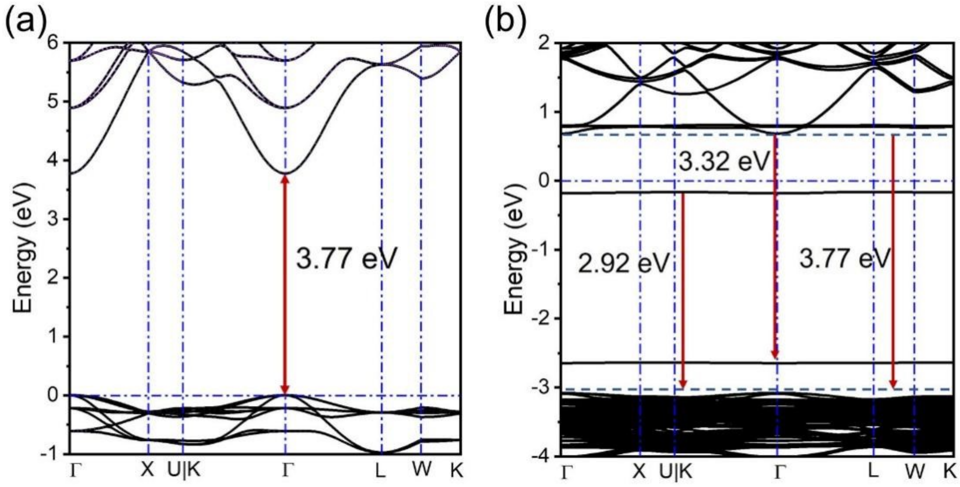

Figure S8 The band structures of RbI (a) and Sn^{2+}-doped RbI (b) NCs.

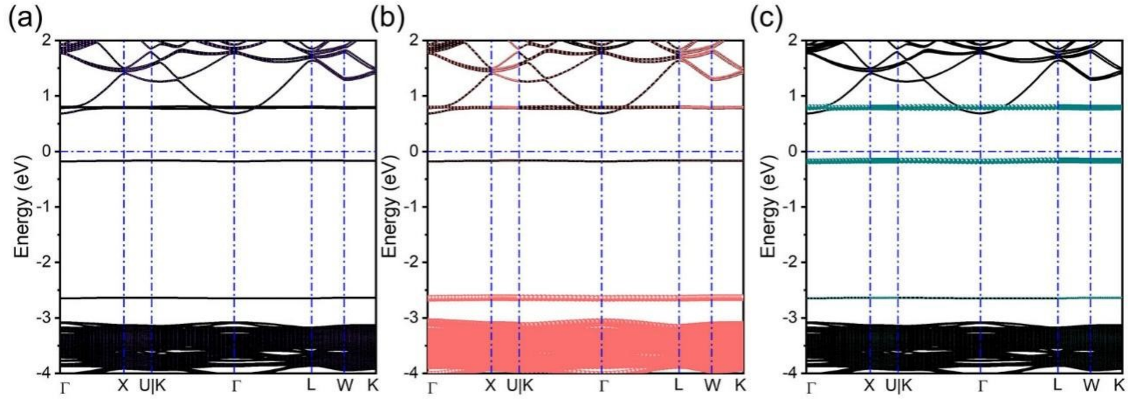

Figure S9 Energy band structure of Rb-pband (a) I-pband (b), Sn-pband (c) in Sn(II)-doped RbI NCs.

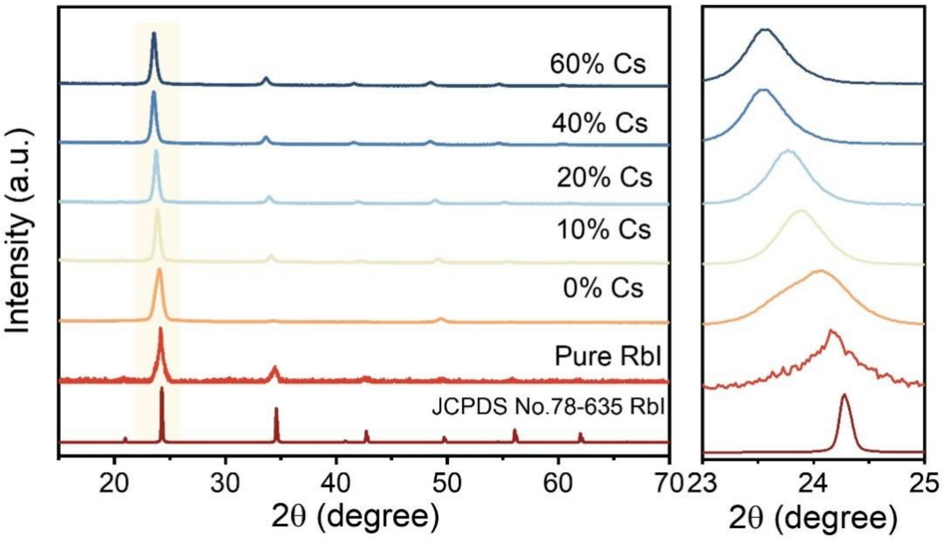

Figure S10 XRD patterns of Sn^{2+}- doped RbI NCs with increased doping of Cs^{+} ions.

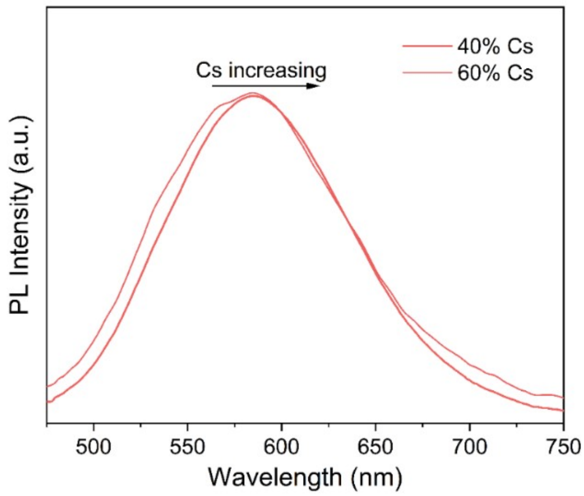

Figure S11 The photoluminescence spectrum of Sn^{2+} doped $Rb_xCs_{1-x}I$ NCs.

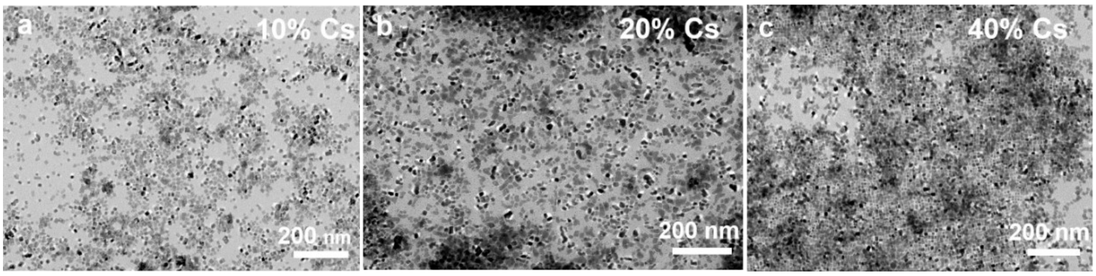

Figure S12 TEM images of Sn^{2+}-doped $Rb_xCs_{1-x}I$ NCs. (a) x= 0.9, (b) x= 0.8, (c) x= 0.6.

Table S1 The stability of Sn(II) doping and Sn(II)-based perovskites.

Materials	Categories	PL peak (nm)	PLQY (%)	Stability (days)	Ref.
Sn(II)-doped CsI	Microcrystals	750	21.5	Over 3 months	1
$MASnI_3$	Nanocrystals	750	0.06	/	2
$FASnI_3$	Nanocrystals	770−830	0.1	/	3
$CsSnI_3$	Nanocrystals	849	18.4	/	4
$CsSnBr_3$	Nanocrystals	680	0.14	/	5
$CsSn(Br_{0.5}I_{0.5})_3$	Nanocrystals	720	0.05	/	5
Sn^{2+}-doped RbI	**Nanocrystals**	**568**	**91.9**	**Over 3 week**	**/**

Table S2 Photoluminescence quantum efficiency (PLQY) of Sn^{2+}-doped $Rb_xCs_{1-x}I$ NCs.

Compound	PLQY (%)	PL peak (nm)	FWHM (nm)
10% Cs^+	32.7	573	106
20% Cs^+	55.7	574	109
40% Cs^+	16.5	578	113
60% Cs^+	5.1	574	104

References

1 S. Das Adhikari, S. Masi, C. Echeverría-Arrondo, S. Miralles-Comins, R. S. Sánchez, J. A. Fernandes, V. Chirvony, J. P. Martínez-Pastor, V. Sans and I. Mora-Seró, *Adv. Opt. Mater.*, 2021, **9**, 2101024.

2 L. Dai, J. Ye and N. C. Greenham, *Light-Sci. Appl.*, 2023, **12**, 208–219.

3 D. N. Dirin, A. Vivani, M. Zacharias, T. V. Sekh, I. Cherniukh, S. Yakunin, F. Bertolotti, M. Aebli, R. D. Schaller, A. Wieczorek, S. Siol, C. Cancellieri, L. P. H. Jeurgens, N. Masciocchi, A. Guagliardi, L. Pedesseau, J. Even, M. V. Kovalenko and M. I. Bodnarchuk, *Nano Lett.*, 2023, **23**, 1914–1923.

4 Q. Liu, J. Yin, B.-B. Zhang, J.-K. Chen, Y. Zhou, L.-M. Zhang, L.-M. Wang, Q. Zhao, J. Hou, J. Shu, B. Song, N. Shirahata, O. M. Bakr, O. F. Mohammed and H.-T. Sun, *J. Am. Chem. Soc.*, 2021, **143**, 5470–5480.

5 T. C. Jellicoe, J. M. Richter, H. F. J. Glass, M. Tabachnyk, R. Brady, S. E. Dutton, A. Rao, R. H. Friend, D. Credgington, N. C. Greenham and M. L. Böhm, *J. Am. Chem. Soc.*, 2016, **138**, 2941–2944.