Giant Emission Enhancement from $Cs_3Bi_2Br_9$ via Oxygen-induced Optimization of Radiation Channels

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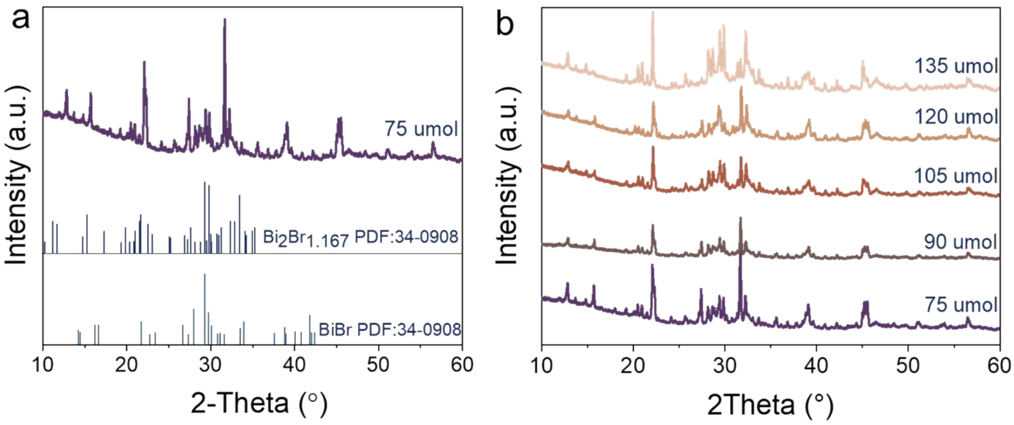


Figure S1 (a) XRD patterns of $Cs_3Bi_2Br_9$ with 75 umol OLAM, and the standard PDF card of $Bi_2Br_{1.167}$ and BiBr. (b) XRD patterns of $Cs_3Bi_2Br_9$ with different OLAM content of 75, 90, 105, 120, and 135 umol, respectively.

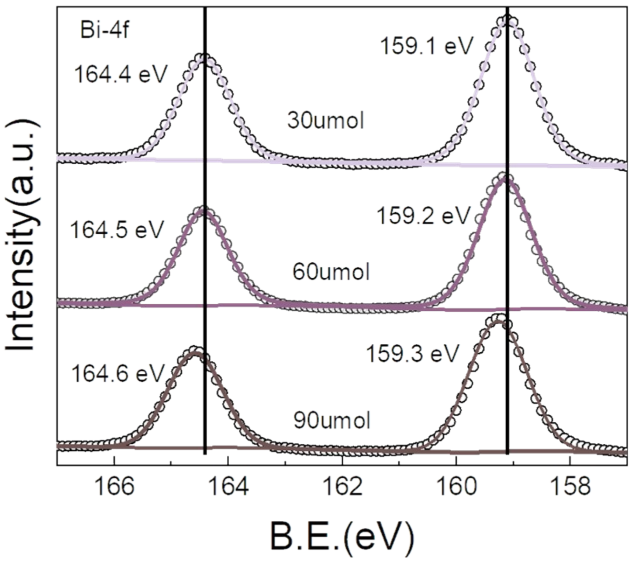
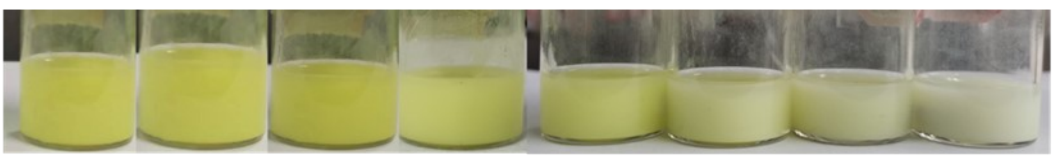


Figure S2 XPS spectra of $Cs_3Bi_2Br_9$ samples with different content of OLAM.



30 umol 45 umol 60 umol 75 umol 90 umol 105 umol 120 umol 135 umol

Figure S3 The photographs of synthesized $Cs_3Bi_2Br_9$ solution in ethanol, with different content of

OLAM.

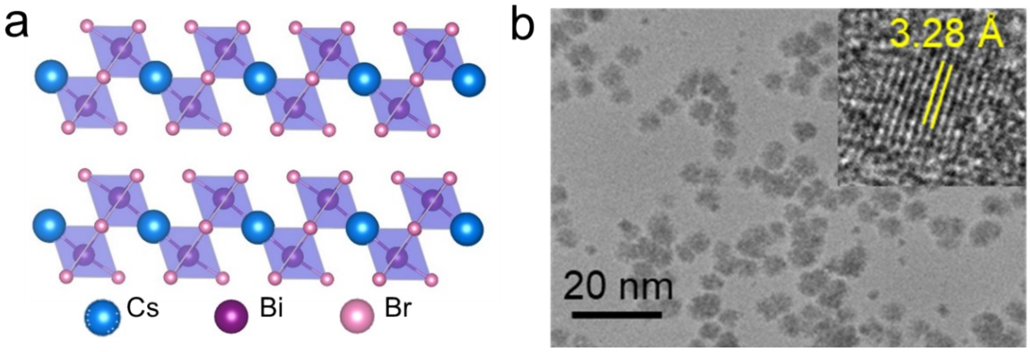


Figure S4 (a) Crystal structure of $Cs_3Bi_2Br_9$. (b) The TEM and HRTEM images of $Cs_3Bi_2Br_9$.

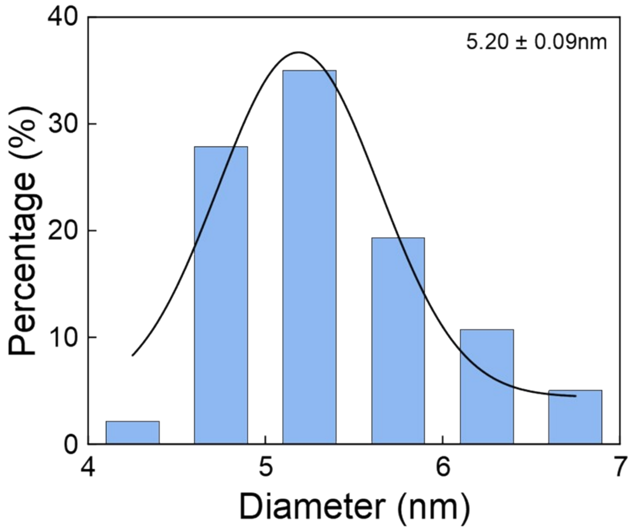


Figure S5 Size distribution histogram of the $Cs_3Bi_2Br_9$ crystals based on TEM images.

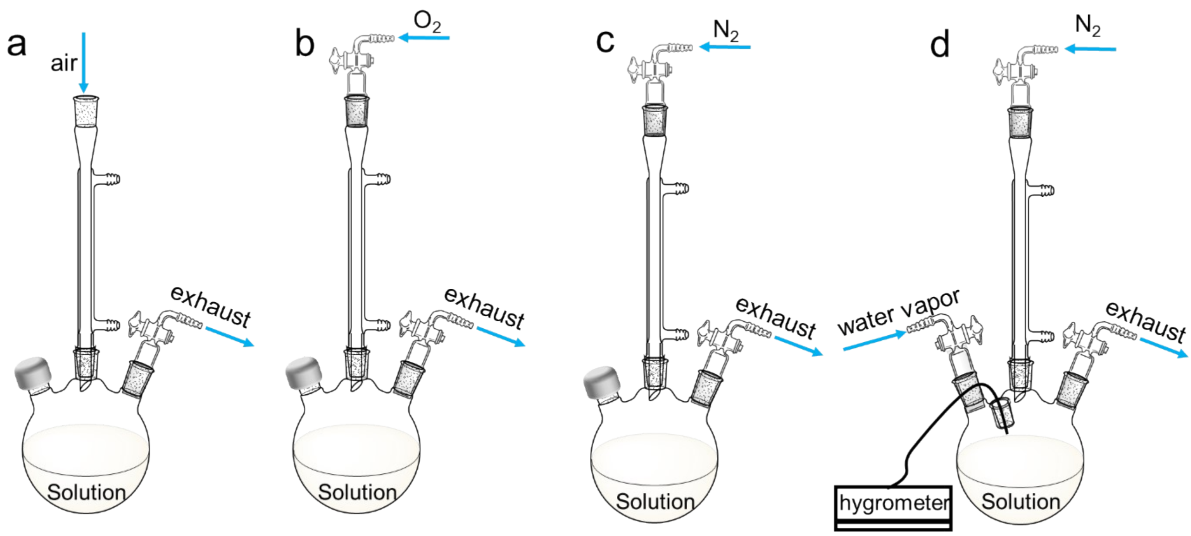


Figure S6 Schematic diagrams of the different atmospheric environments of (a) ambient air, (b) dry oxygen (O_2), (c) dry nitrogen (N_2), and (d) moist nitrogen with 40% relative humidity.

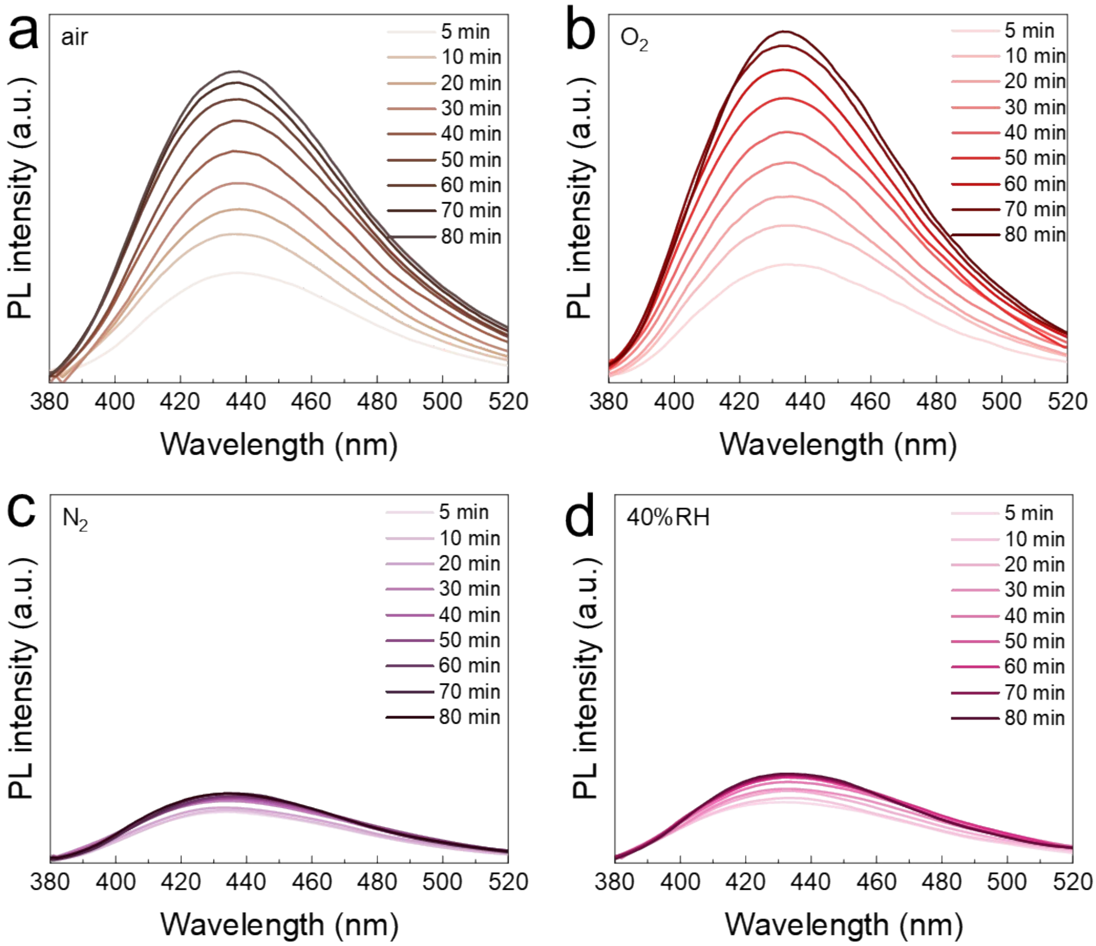


Figure S7 The PL spectra of $Cs_3Bi_2Br_9$ during longtime exposure in different conditions.

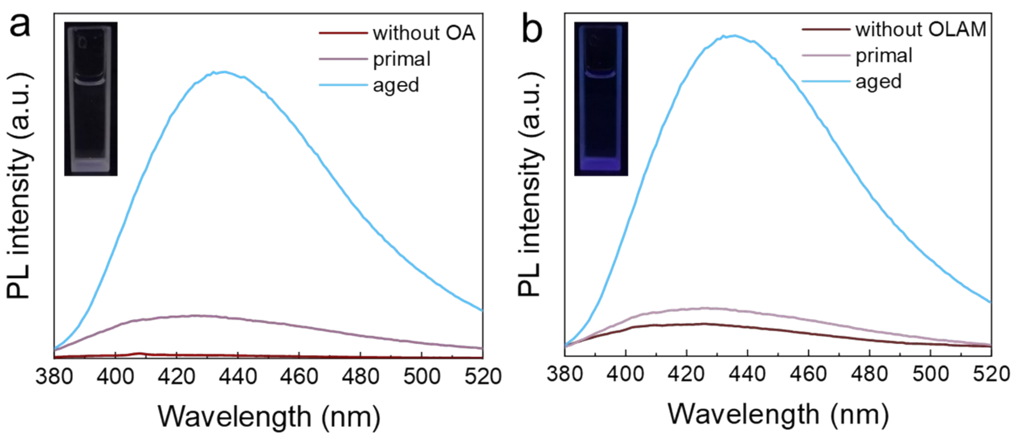


Figure S8 The PL spectra of $Cs_3Bi_2Br_9$ prepared without (a) OA and (b) OLAM, as compared with the primal and aged samples.

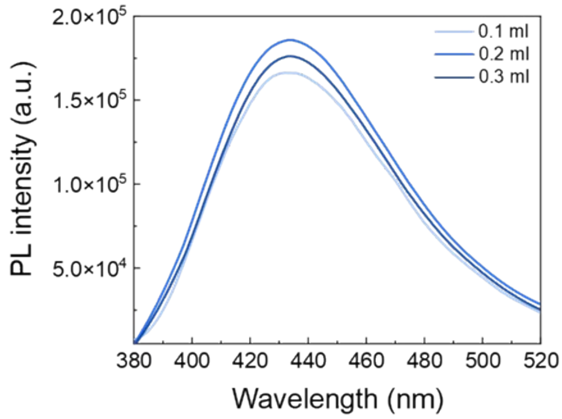


Figure S9 The PL spectra of $Cs_3Bi_2Br_9$ with different OA content.

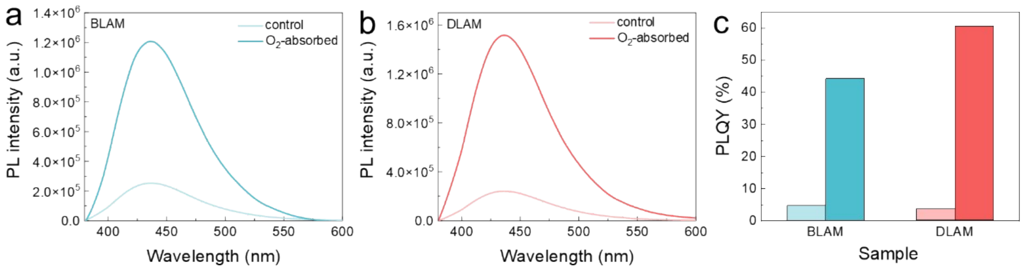


Figure S10 PL spectra of $Cs_3Bi_2Br_9$ with (a) BLAM and (b) DLAM for control and O_2-absorbed samples, with (c) corresponding PLQY.

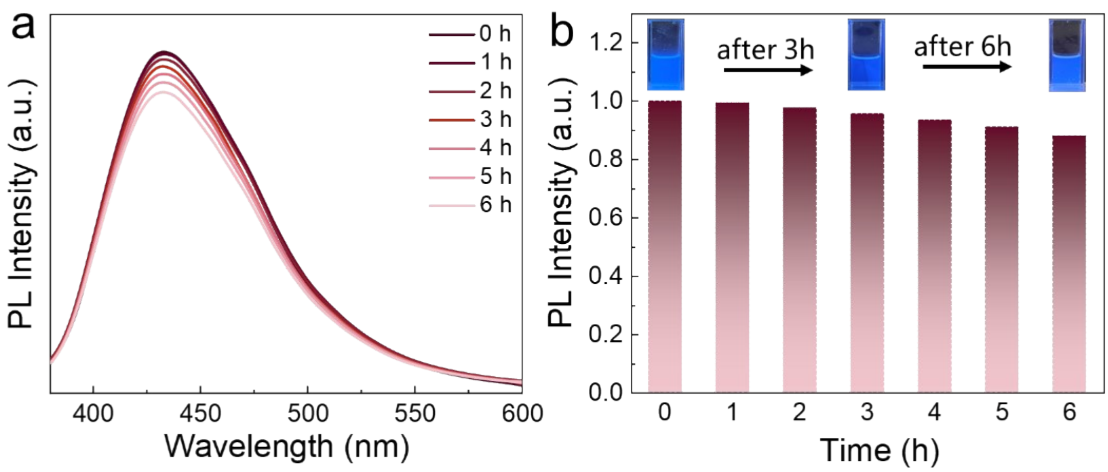


Figure S11 (a) PL spectra of $Cs_3Bi_2Br_9$ solution during prolonged mixing with deionized water and (b) the corresponding statistical analysis of normalized peak intensities.

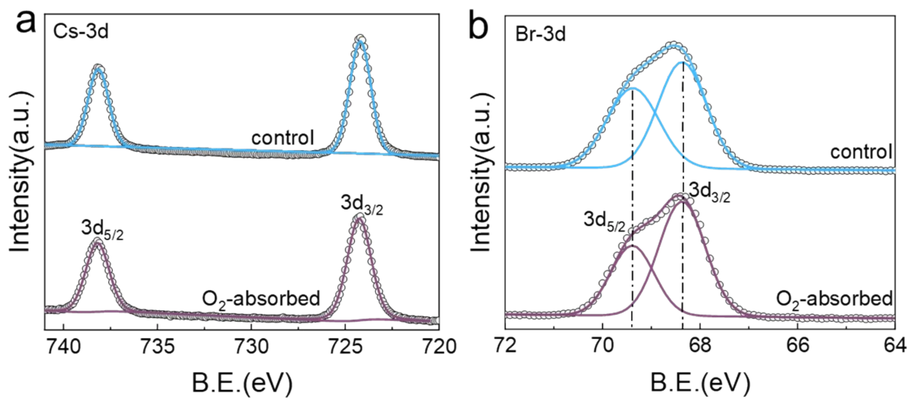


Figure S12 XPS spectra of (a) Cs-3d and (b) Br-3d for control and O_2-absorbed $Cs_3Bi_2Br_9$ NCs.

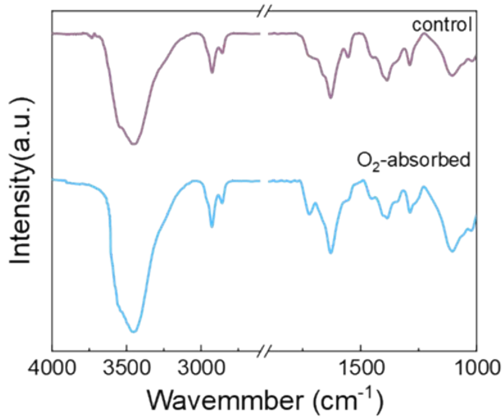


Figure S13 FTIR spectra of control and O_2-absorbed $Cs_3Bi_2Br_9$ samples.

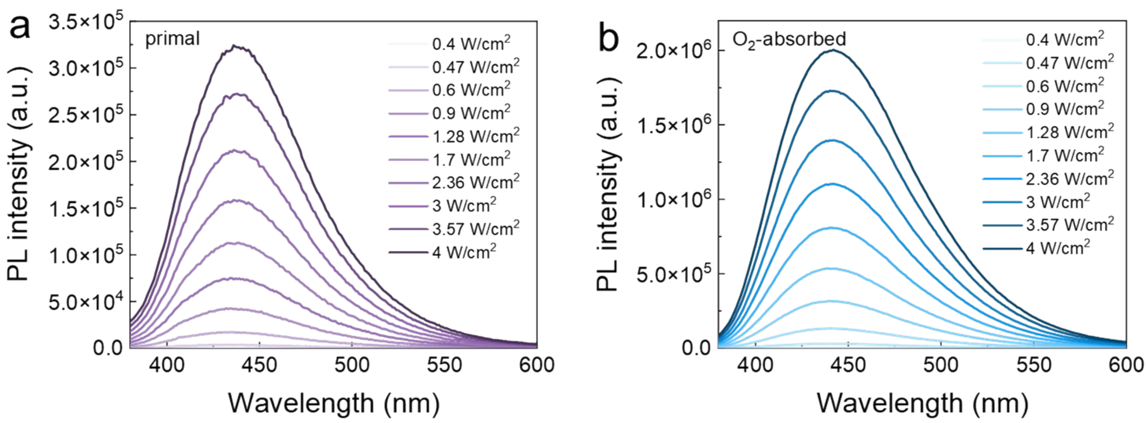


Figure S14 PL spectra of (a) control and (b) O_2-absorbed $Cs_3Bi_2Br_9$ under different excitation power intensities.

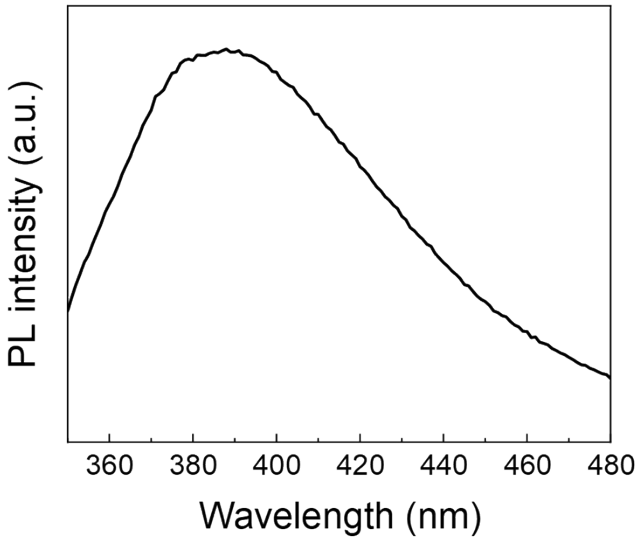


Figure S15 PL spectra of mixed solution with oleic acid (OA), n-octylamine (OLAM) and dimethyl sulfoxide (DMSO) used for $Cs_3Bi_2Br_9$ preparation.

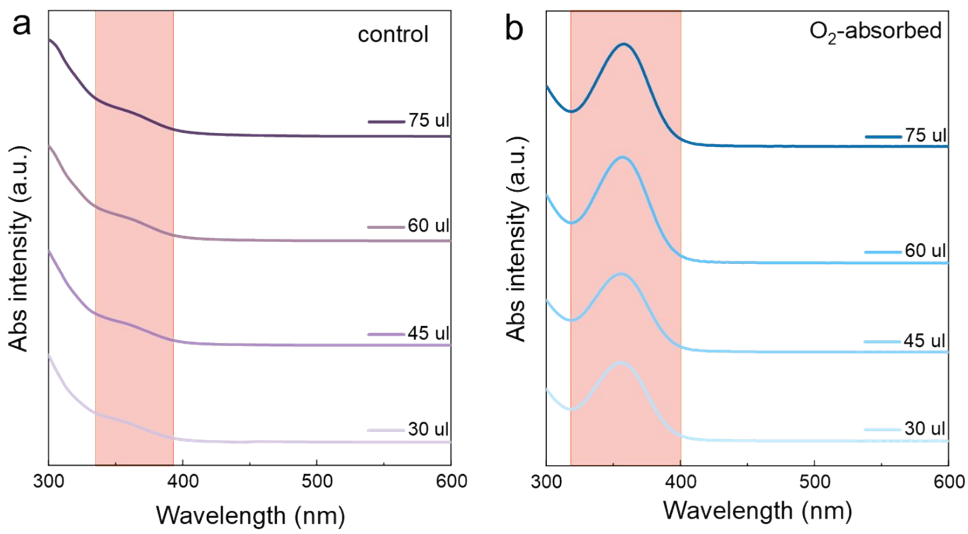


Figure S16 UV-vis absorption spectra of (a) control and (b) O_2-absorbed $Cs_3Bi_2Br_9$ with different OLAM content.

Table S1 PL lifetime for primal and aged $Cs_3Bi_2Br_9$ NCs in ethanol solution

Sample	A_1	τ_1	A_2	τ_1	τ
Control $Cs_3Bi_2Br_9$	0.97	1.61	0.10	1.63	1.61
O_2-absorbed $Cs_3Bi_2Br_9$	0.77	5.67	0.23	12.27	7.19

Table S2 PL lifetime for primal and aged $Cs_3Bi_2Br_9$ NCs under different temperature

Sample	A_1	τ_1	A_2	τ_1	τ
Primal-100 K	0.73	2.07	0.27	11.86	4.71
Primal-180 K	0.92	1.87	0.09	12.48	2.84
Primal-260 K	0.93	1.71	0.08	10.23	2.39
Primal-300 K	0.97	1.61	0.10	1.63	1.61
Aged-100 K	0.69	6.59	0.31	11.85	8.22
Aged-180 K	0.71	6.52	0.30	11.57	8.10
Aged-260 K	0.74	5.45	0.27	12.39	7.48
Aged-300 K	0.77	5.67	0.23	12.27	7.19