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Efficient and Reabsorption-Free Radioluminescence in $Cs_3Cu_2I_5$ Nanocrystals with Self-Trapped Excitons

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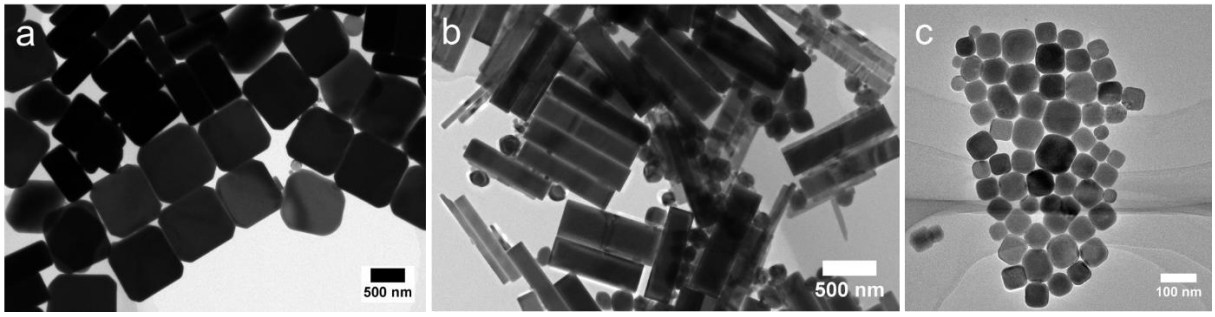

Figure S1. TEM images of (a) $Cs_3Cu_2Cl_5$, (b) $Cs_3Cu_2Br_5$, and (c) $Cs_3Cu_2I_5$, without the addition of InX_3, the $Cs_3Cu_2X_5$ NCs grew too large and loss colloidal stability in solvents.

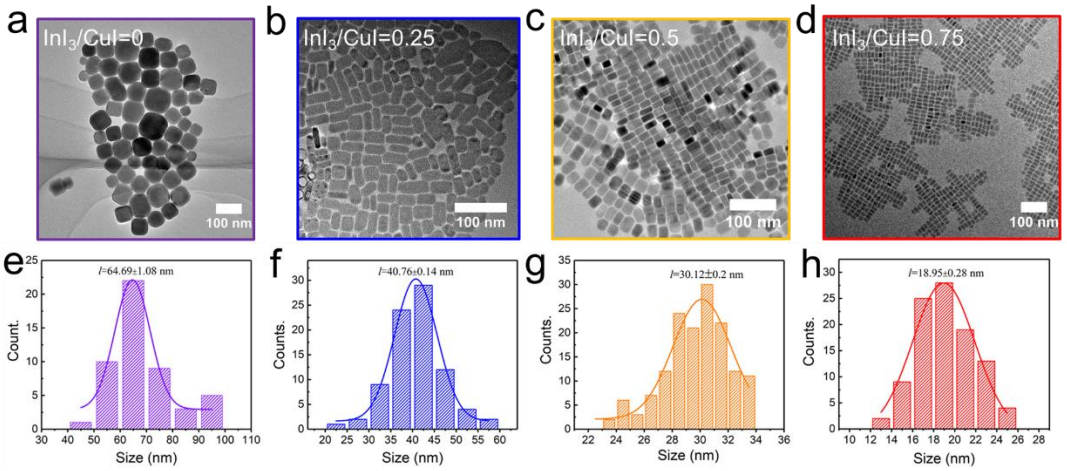

Figure S2. The obtained TEM images of $Cs_3Cu_2I_5$ NCs by changing the InI_3-to-CuI molar ratio in the reactant, InI_3/CuI= (a) 0, (b) 0.25, (c) 0.5, (d) 0.75. The corresponding size distribution of TEM images of (a-b) is shown in (e-h).

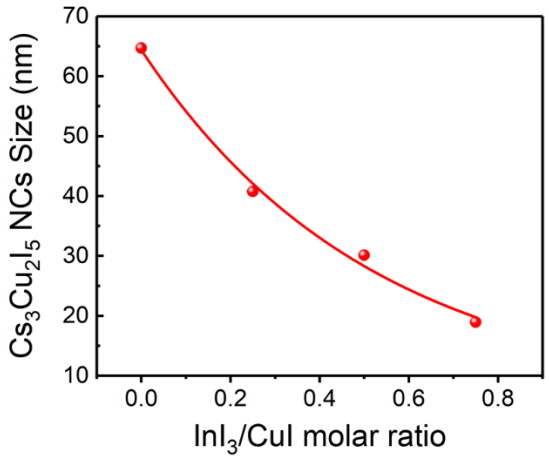

Figure S3. Dependence of the $Cs_3Cu_2I_5$ NCs size on the InI_3-to-CuI molar ratio in the reactant.

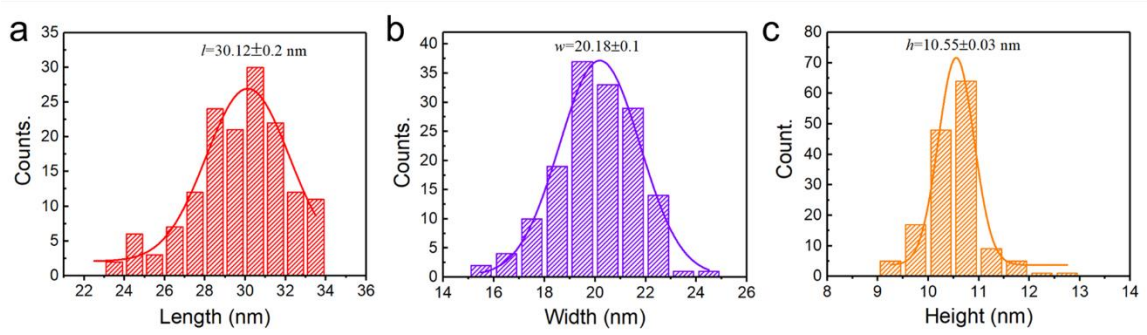

Figure S4. Distributions of three characteristic dimensions of $Cs_3Cu_2I_5$ NCs. (a) the side length, *l*=30.12±0.2 nm; (b) the side width, *w*=20.18±0.1 nm; (c) the height, *h*=10.55±0.03 nm.

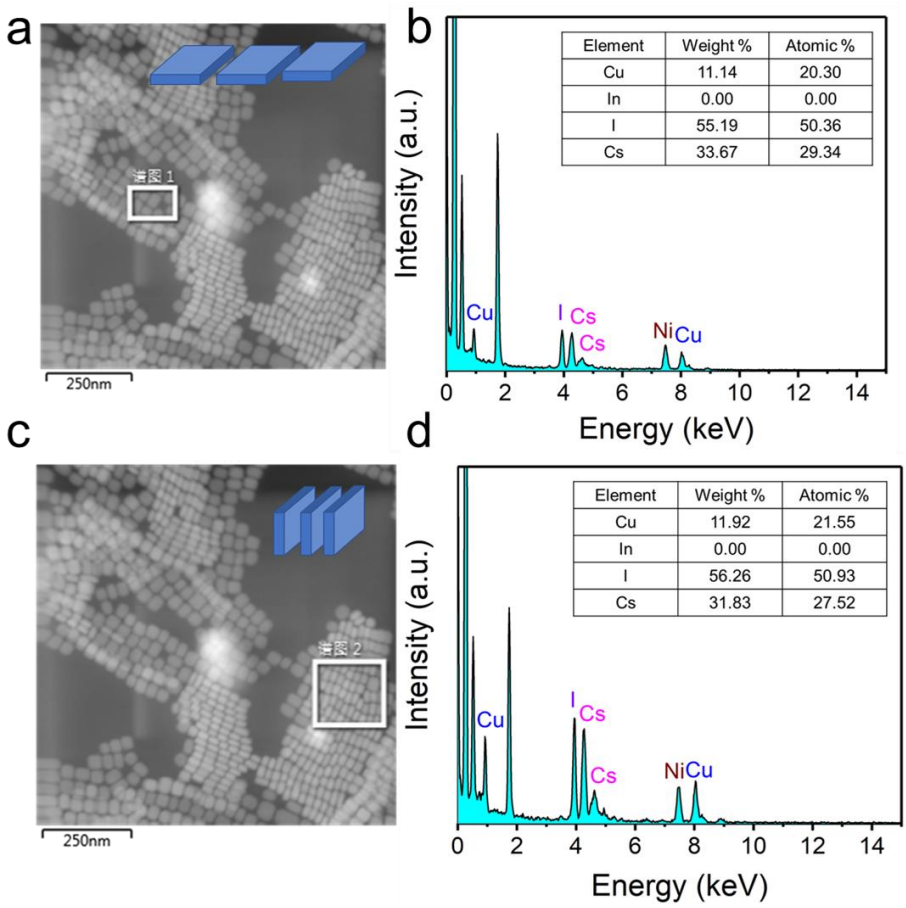

Figure S5. (a) HADDF-STEM image of $Cs_3Cu_2I_5$ NCs lying flat on grid and (b) the corresponding EDS spectrum and elemental analysis of $Cs_3Cu_2I_5$ NCs. (c) HADDF-STEM image of the cross-section of $Cs_3Cu_2I_5$ NCs by face-to-face manner on grid and (d) the corresponding EDS spectrum and elemental analysis of $Cs_3Cu_2I_5$ NCs.

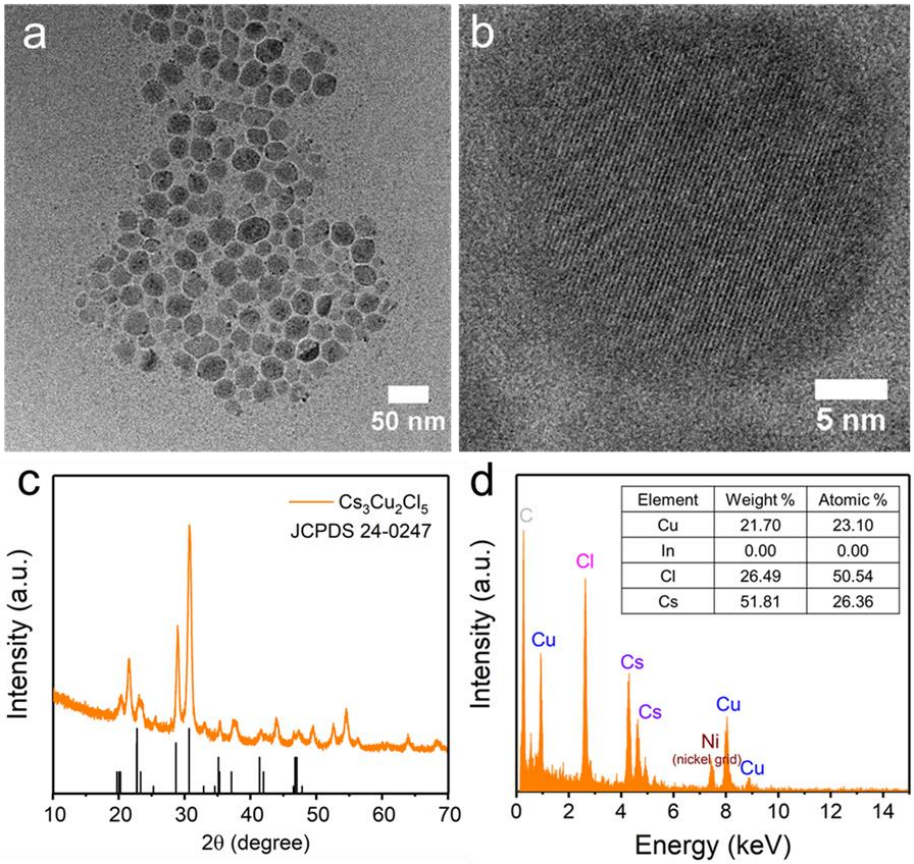

Figure S6. (a) TEM and (b) HRTEM images of $Cs_3Cu_2Cl_5$ NCs. (c) XRD pattern and (d) EDS spectrum and elemental analysis of $Cs_3Cu_2Cl_5$ NCs. We note that to avoid copper interference, we use nickel grid.

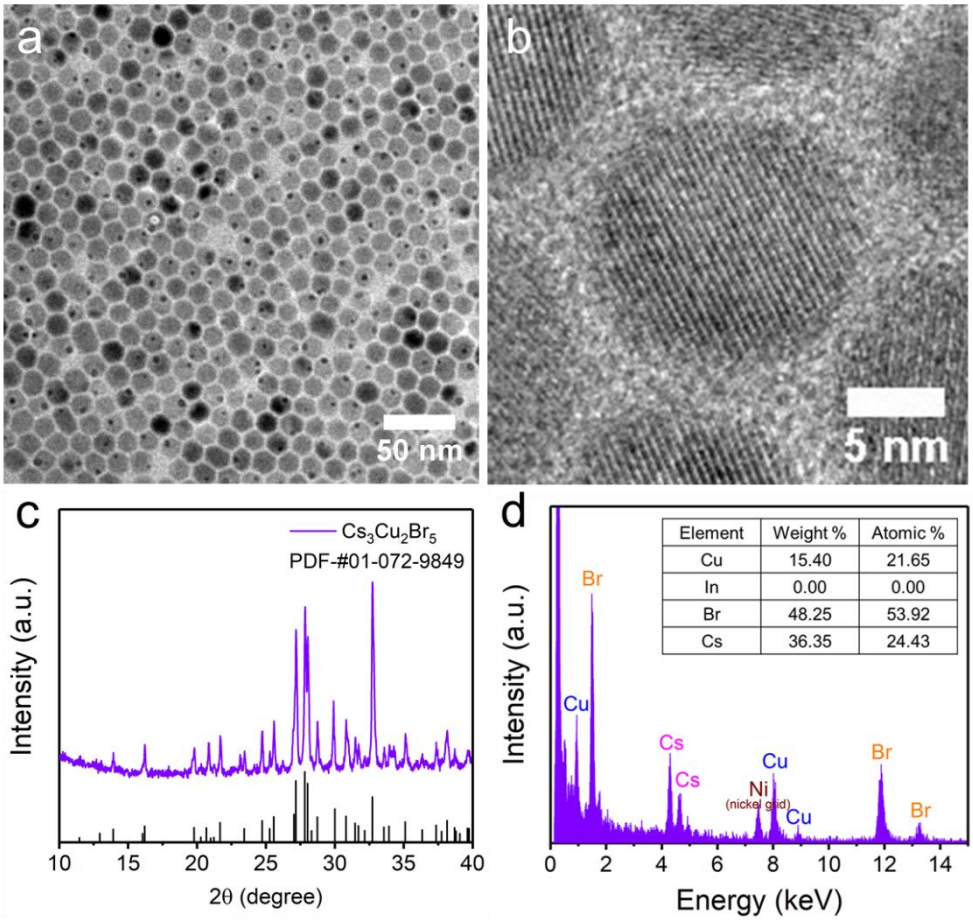

Figure S7. (a) TEM and (b) HRTEM images of $Cs_3Cu_2Br_5$ NCs. (c) XRD pattern and (d) EDS spectrum and elemental analysis of $Cs_3Cu_2Br_5$ NCs.

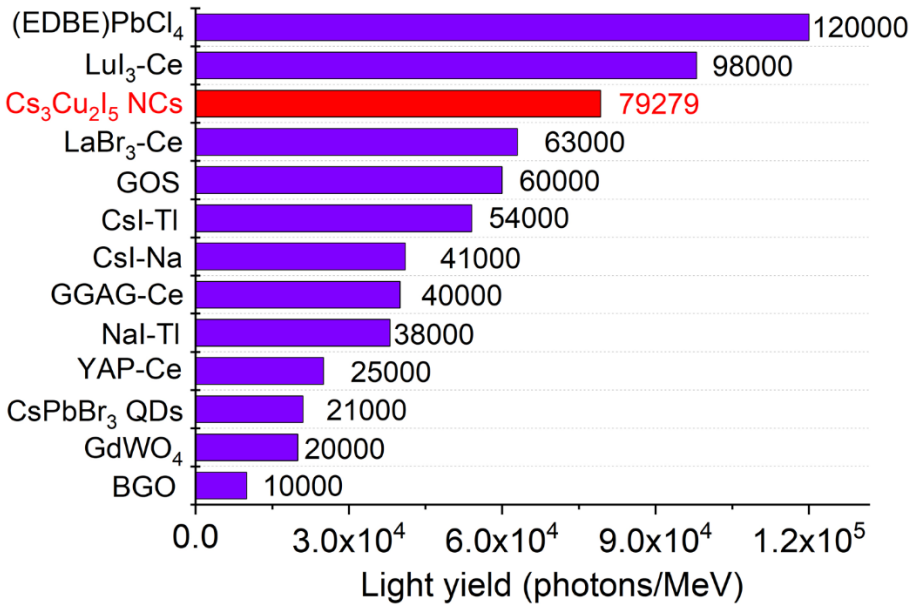

Figure S8. Light yield comparison of the $Cs_3Cu_2I_5$ NCs and some conventional scintillators.[1-3]

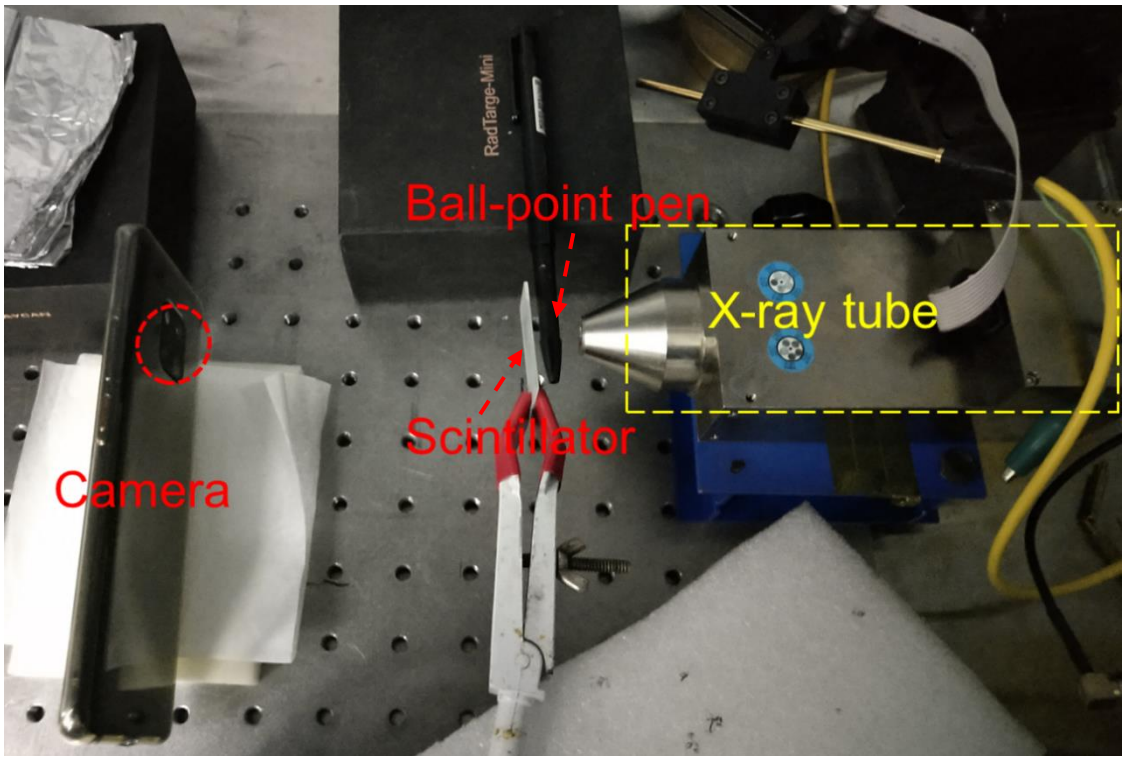

Figure S9. Prototype projection system for X-ray imaging.

Table S1. Optical Properties Comparison of Different Lead-Free Perovskite or Perovskite-Like NCs with Blue Emission.

Nanocrystals	PL peak (nm)	FWHM (nm)	Eb (meV)	PLQY (%)	Ref.
$MA_3Bi_2Br_9$	430	62		12	4
$Cs_3Bi_2Br_9$	460	45	67±5	4.5	5
$Cs_3Bi_2Br_9$	410	48	210.7	19.4	6
Cl-$MA_3Bi_2Br_9$	422	41	259.1	54.1	7
$Rb_7Bi_3Cl_{16}$	437	93		28.4	8
$Cs_3Sb_2Br_9$	410	41	548	46	9
$Cs_3Cu_2I_5$	441		371	67	10
$Cs_3Cu_2I_5$	444	79		35	11
$Cs_3Cu_2I_5$	445	80	335.59	73.7	This work

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