Supplementary Information

Enhancing the performance of LARP-synthesized $CsPbBr_3$ nanocrystal LEDs by employing a dual hole injection layer

Dingyan Xu[a], Qun Wan[b], Siyao Wu[a], Yu Zhao[a], Xinglei Xu[a], Liang Li[b], and Gufeng He[a*]

[a]National Engineering Lab for TFT-LCD Materials and Technologies, Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

[b]School of Environmental Science and Engineering, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

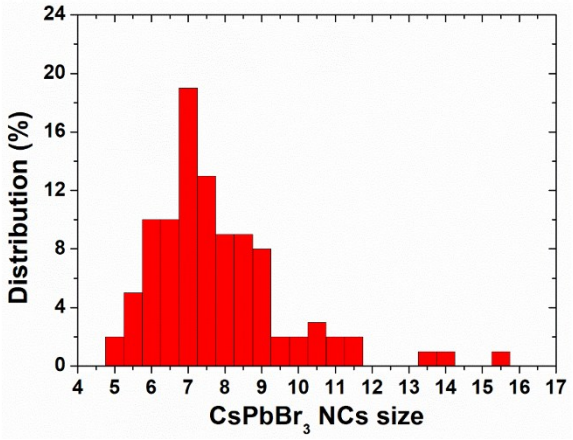

Fig. S1 histogram of size distribution for $CsPbBr_3$ NCs.

*E-mail: gufenghe@sjtu.edu.cn

Table S2 Performances of $CsPbBr_3$ NCs LEDs with different HIL.

Device	V_{on}[a] (V)	L_{max} (cd/m^2)	CE_{max} (cd/A)	PE_{max} (lm/W)	EQE_{max} (%)
A/B/D	-[b]	-	-	-	-
C	2.6	324.7	0.15	0.10	0.11
E	2.3	313.8	0.22	0.17	0.17
F	2.3	332.9	0.23	0.18	0.18

[a]V_{on} is defined as the voltage at 1 cd/m^2.

[b]"-" indicates no light emission

Table S1 Summary of the bi-exponential fitting results for PL lifetime curve of $CsPbBr_3$ NCs film.

τ_{ave} (ns)	A_1	τ_1 (ns)	A_2	τ_2 (ns)
9.3	0.682	5.1	0.318	18.3

The decay curve is fitted to bi-exponential decay functions of time (t):

$$A = A_1 e^{\frac{-t}{\tau_1}} + A_2 e^{\frac{-t}{\tau_2}} \quad (1)$$

Where A is the normalized PL intensity, A_1 and A_2 are the fractions of the two decay components, and τ_1 represents the nonradiative recombination of initial photo-induced excitons through trapping states and τ_2 indicates the bimolecularly radiative recombination of carriers. The average lifetime (τ_{ave}) was calculated with A1, A2, τ_1 and τ_2 according to the following equation:

$$\tau_{ave} = A_1\tau_1 + A_2\tau_2 \quad (2)$$