Electronic Supporting Information

Tunable Electrochemiluminescence from Mixed-Monovalent Cation Perovskite Nanocrystals

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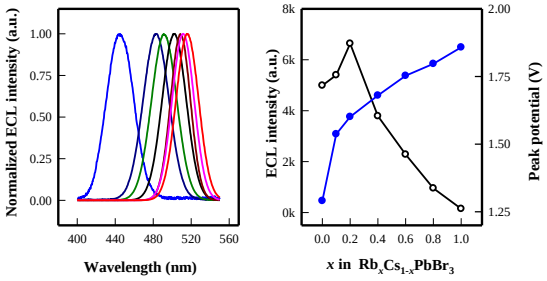
Contents



Colour graphic: Dependence of the anodic ECL emission spectra, intensity and peak potential on the *x* in $Rb_xCs_{1-x}PbBr_3$.

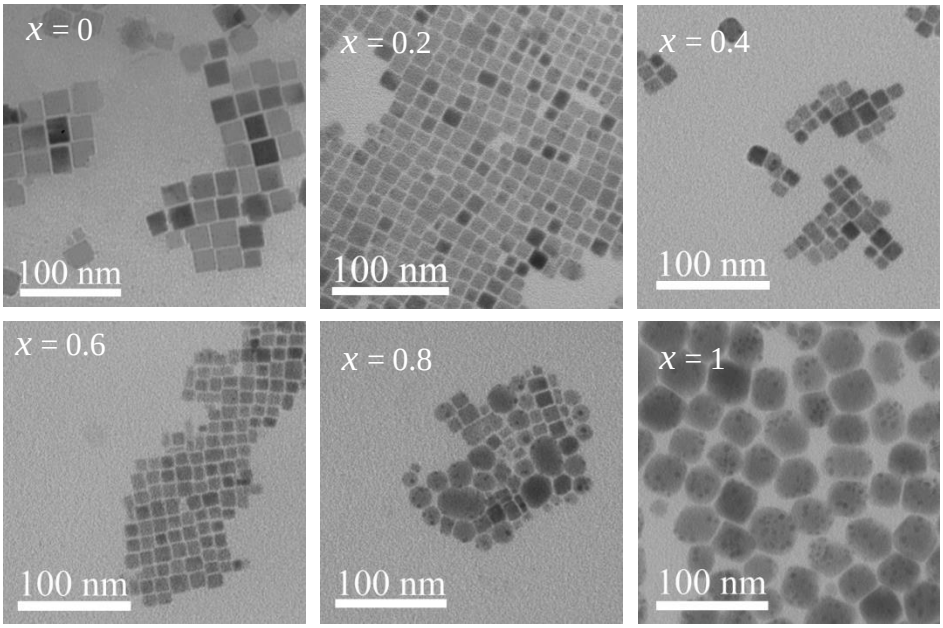


Figure S1. TEM images of $Rb_xCs_{1-x}PbBr_3$ NCs

Table S1. PL lifetime parameters for $CsPbBr_3$ NCs and $Rb_{0.2}Cs_{0.8}PbBr_3$ NCs.

Samples	τ_1 ns	B_1	τ_2 ns	B_2	τ^* ns
$CsPbBr_3$	21.8	2403.6	47.8	596.2	30.9
$Rb_{0.2}Cs_{0.8}PbBr_3$	30.5	2603.4	85.3	395.6	46.8

The PL lifetime traces of both $CsPbBr_3$ NCs and $Rb_{0.2}Cs_{0.8}PbBr_3$NCs could be well fitted with a bi-exponential model by the following equations:

$$I(t) = B_1 \exp(-t/\tau_1) + B_2 \exp(-t/\tau_2)$$

Where I is the luminescence intensity; B_1 and B_2 are constants; t is time; τ_1, τ_2 and τ_3 are lifetimes for the exponential components.

The average lifetime τ^* constant is counted by the following equation:

$$\tau^* = (B_1 \tau_1^2 + B_2 \tau_2^2)/(B_1 \tau_1 + B_2 \tau_2)$$

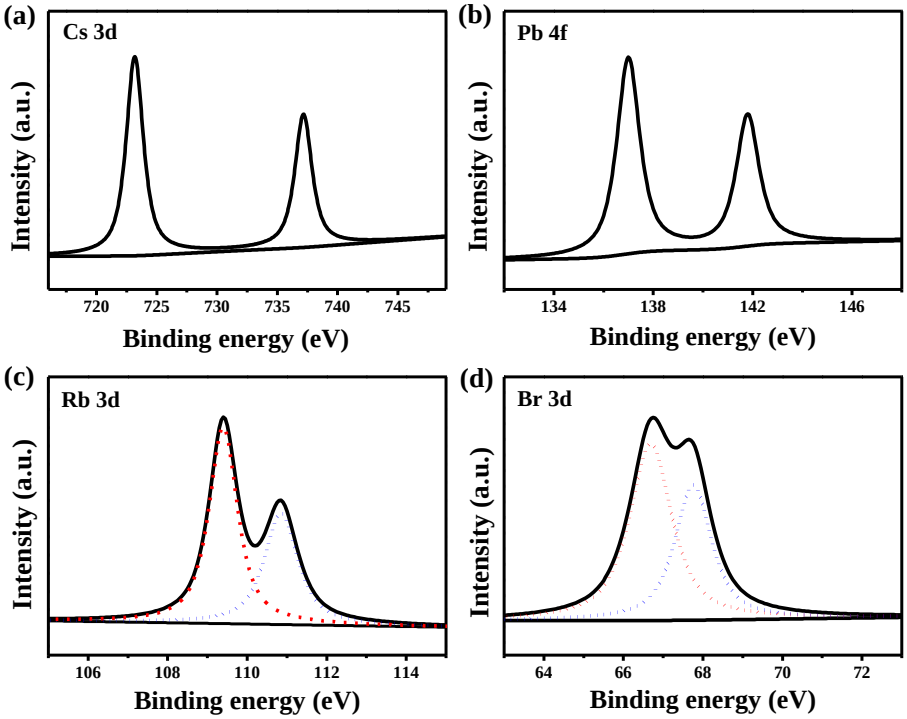


Figure S2. High-resolution XPS spectra of (a) Cs $3d_{3/2}$ and $3d_{5/2}$, (b) Pb $4f_{5/2}$ and $4f_{7/2}$, (c) Rb $3d_{3/2}$ and $3d_{5/2}$, (d) Br 3d of the $Rb_{0.2}Cs_{0.8}PbBr_3$ NCs.

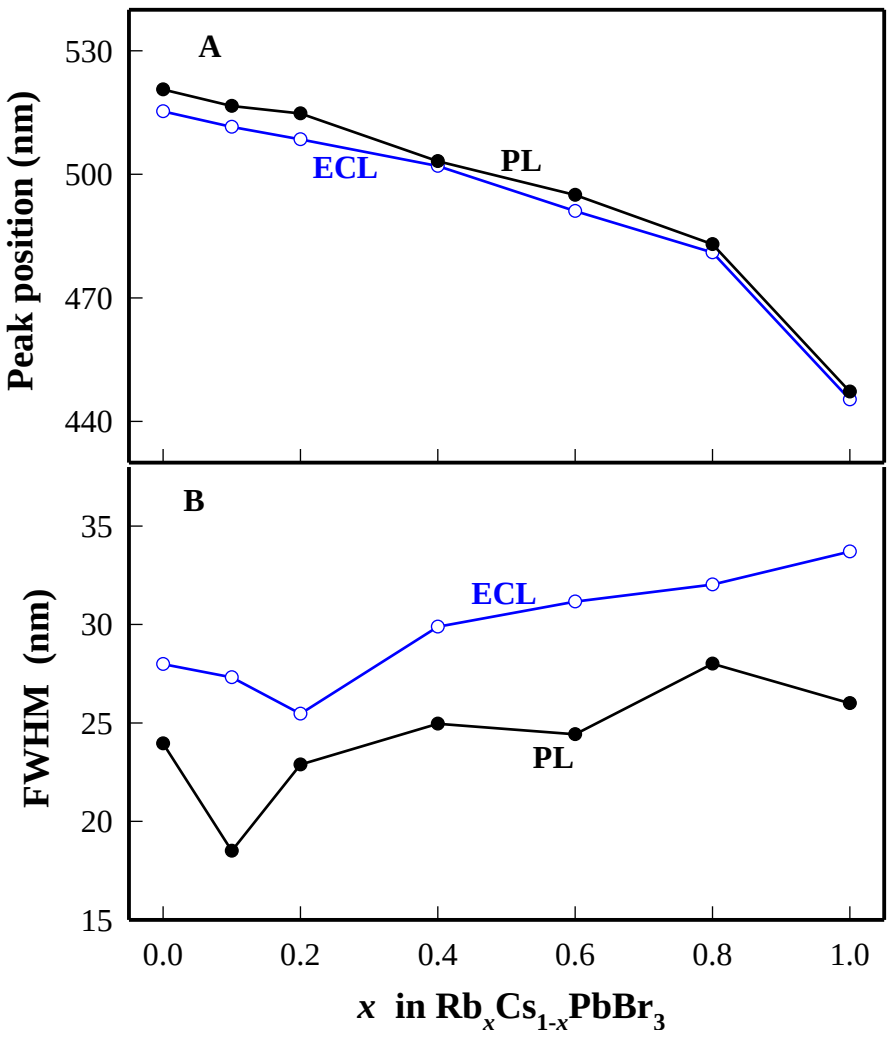


Figure S3. Comparison of the influence of Rb^+ content (x) on the tunable anodic ECL peak position (A) and FWHM in PL emission spectra (B) of $Rb_xCs_{1-x}PbBr_3$ NCs.

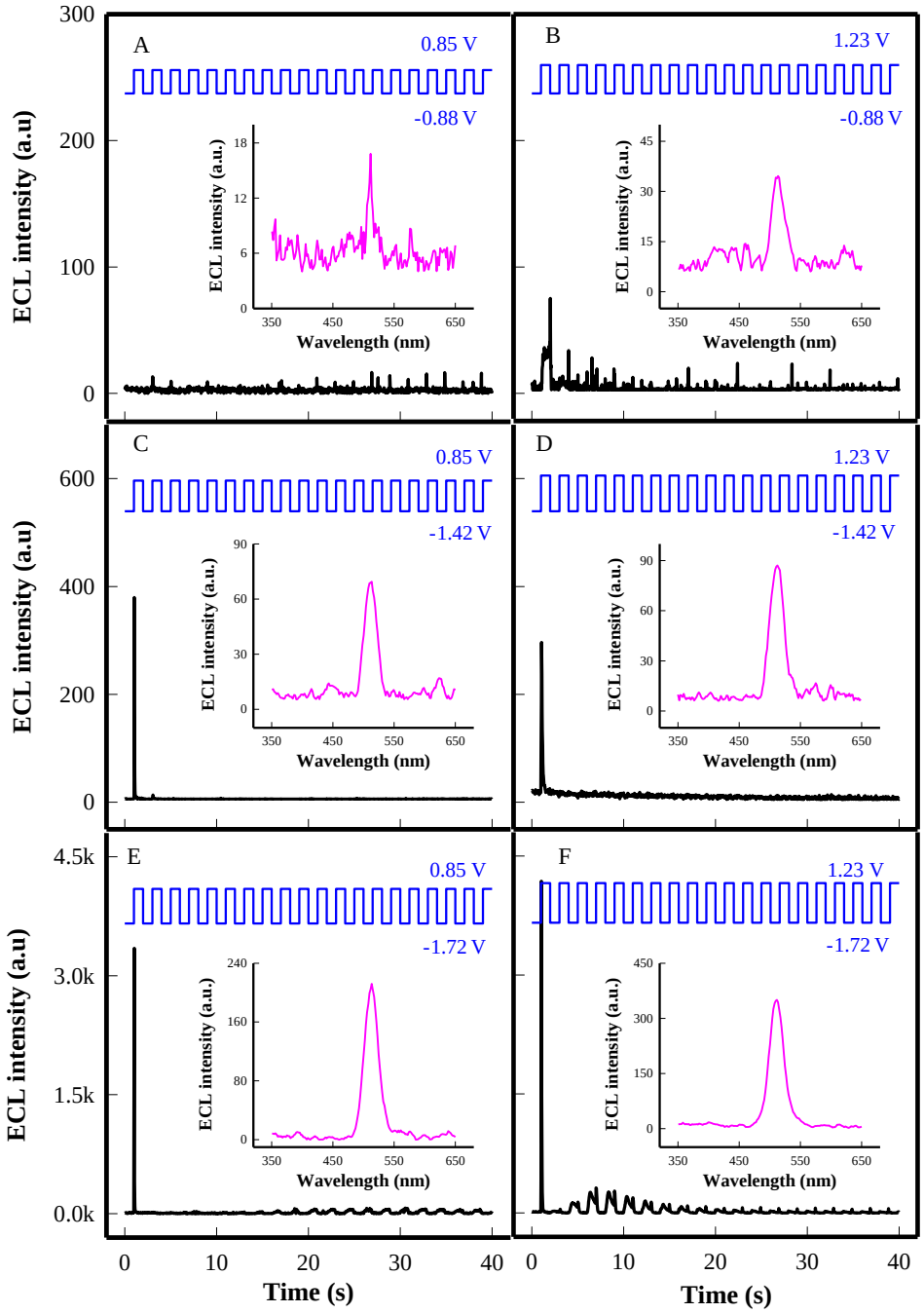


Figure S4. Electron injecting initialed ECL transients of $CsPbBr_3$ NCs|GCE (black line) by stepping the potential between (A) -0.88 V and 0.85 V, (B) -0.88 and 1.23 V, (C) -1.42 V and 0.85 V, (D) -1.42 V and 1.23 V, (E) -1.72 V and 0.85 V, (F) -1.72 V and 1.23 V at 1 Hz for 40 s in air-free dichloromethane containing 0.10 M $TBAPF_6$. The blue lines indicate the applied potential steps. Insets: corresponding ECL emission spectra of $CsPbBr_3$ NCs|GCE (pink line). The exposure time of the CCD was 40 s.

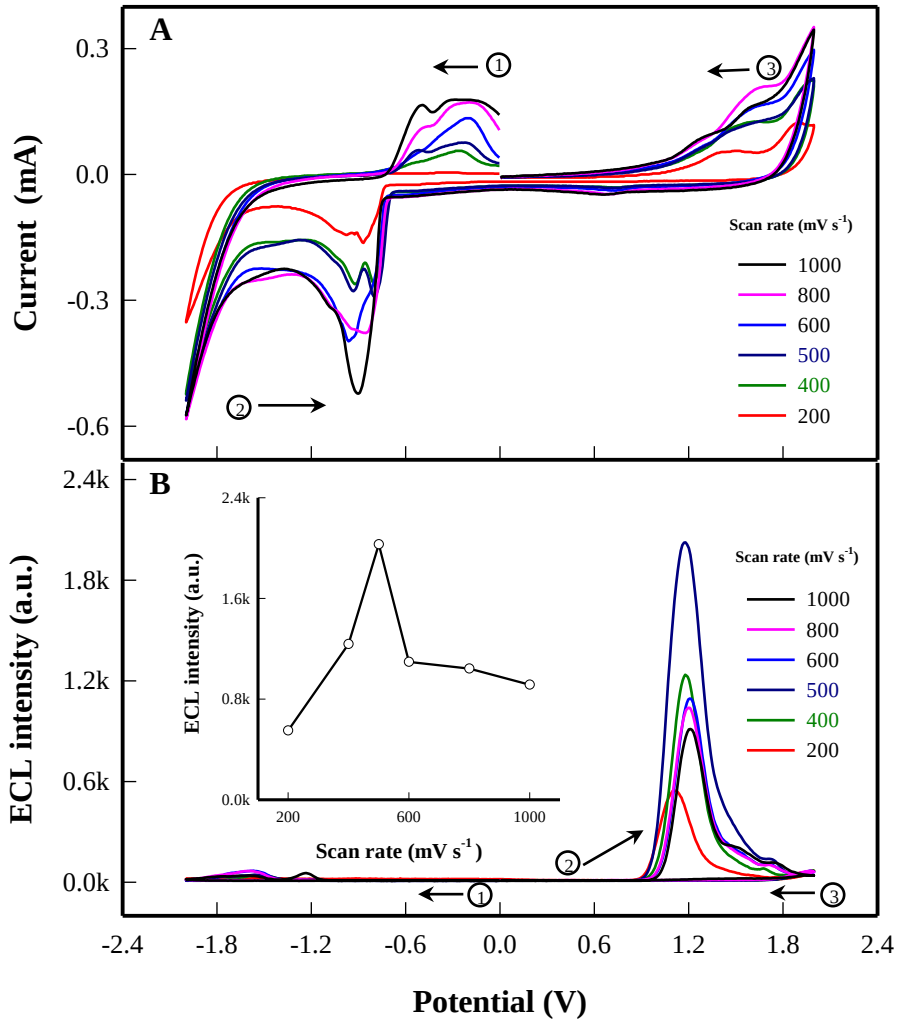


Figure S5. (A) CV and (B) potential-ECL profiles of $Rb_{0.2}Cs_{0.8}PbBr_3$ NCs|GCE in dichloromethane containing 0.1 M $TBAPF_6$ by scanning the electrode from 0 → -2.0 V → 2.0 V → 0 at different scan rates. Inset: Anodic ECL intensity at different scanning rates.

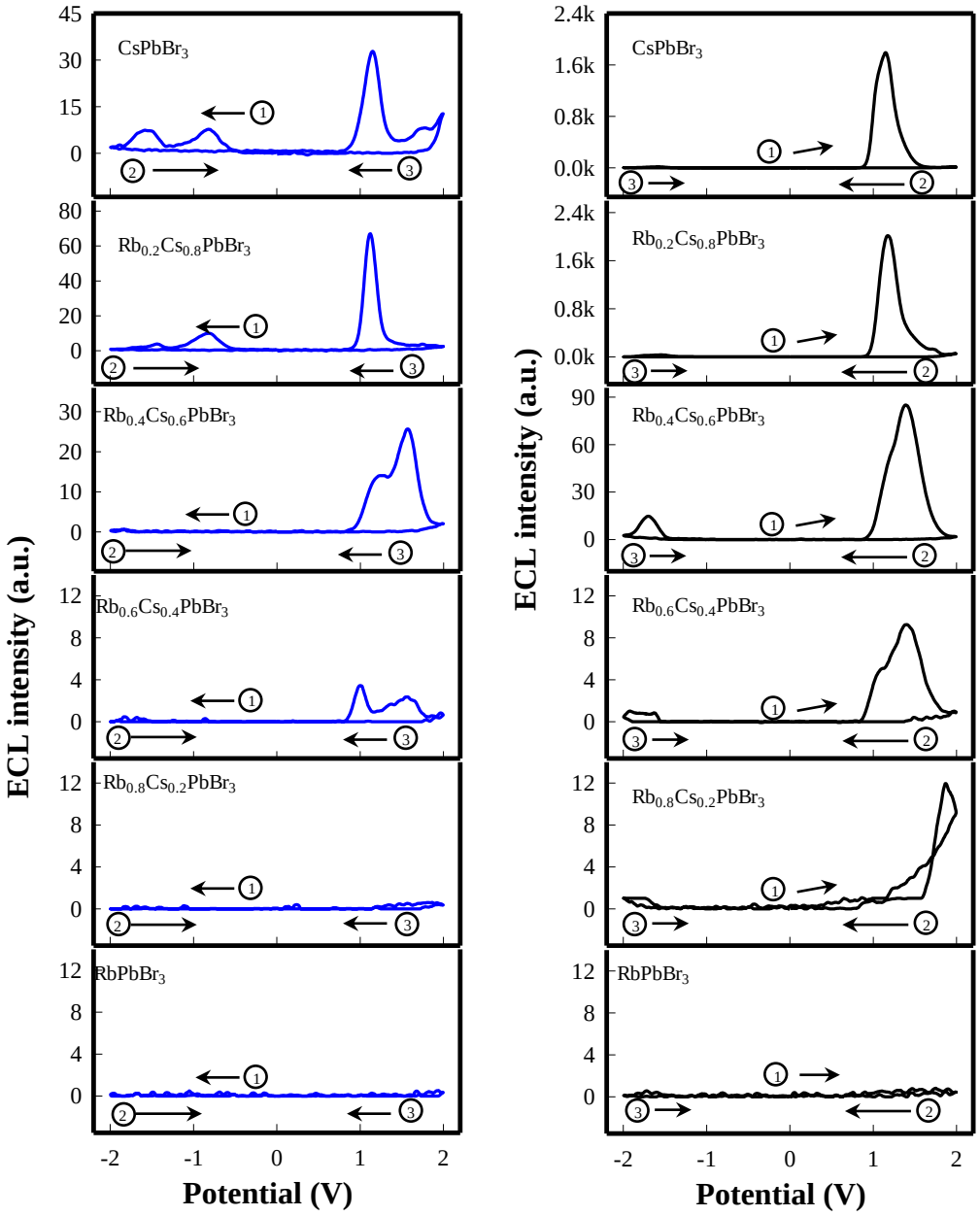


Figure S6. ECL profiles of $Rb_xCs_{1-x}PbBr_3$ NCs|GCE in air-free dichloromethane containing 0.1mM $TBAPF_6$ with negative (blue lines) or positive (black lines) initial potential scan from 0 V. The scanning rate was 500 mV/s. (The inset arrows indicated the potential scan direction)