## **Supplemental Information for**

## Role of Electrochemical Reactions in the Degradation of Formamidinium Lead Halide Hybrid Perovskite Quantum Dots

Kyoungsoo Kim,<sup>a†</sup> YeJi Shin,<sup>b†</sup>, ChaeHyun Lee,<sup>b</sup> Hyeri Jeon,<sup>a</sup> Seog Joon Yoon,<sup>b\*</sup> Donghoon Han<sup>a\*</sup>

<sup>a</sup>Department of Chemistry, The Catholic University of Korea, Bucheon, Gyeonggi-do 14662,

Republic of Korea

<sup>b</sup>Department of Chemistry, College of Natural Science, Yeungnam University, 280 Daehak-Ro,

Gyeongsan, Gyeongbuk-do, 38541, Republic of Korea



**Figure S1.** A TEM image of formamidinium lead halide perovskite quantum dots (PQDs), those magnification was lower than the magnification for the TEM image shown in Figure 1A.



**Figure S2.** Cyclic voltammograms of the FAPbBr<sub>3</sub> PQDs dispersed in DCM containing 0.1 M TBAFP, which were recorded over three successive cycles in the entire potential range at a scan rate of 50 mV/s. Potential scan initiated at 0.0 V in the positive direction.



**Figure S3.** Spectroelectrochemical analysis of FAPbBr<sub>3</sub> under applied potential while (A) decreasing potential starting from 0.0 V to -1.2 V in -0.2 V steps, (B) increasing potential starting from -1.2 V to +1.8 V in +0.2 V steps, and (C) decreasing potential starting from +1.9 V to -0.9 V in -0.2 V steps.



**Figure S4.** Surface images of Au working electrodes. (A) Partially covered (red circle) white precipitate was shown on the Au electrode after CV measurements. (B) The white precipitate covered while exposed area of the Au electrode after CV measurements. (C) Polished the Au electrode before performing the CV.



**Figure S5.** (A-C) Two FAPbBr<sub>3</sub> PQD dispersed solutions, which has identical composition for CV measurement with containing  $Bu_4NPF_6$  (supporting electrolyte), after applying bias (50 V) in 24 hours (left) or before applying potential (right). (A,C) Images were obtained under natural light with different view to observe color, transparency, and the white precipitate. (B) Image were obtained under UV lamp (365 nm irradiation). (D) Used working electrode (ITO). The white precipitate was deposited on the Film.



**Figure S6.** (A) TEM image of FAPbBr<sub>3</sub> PQD dispersed solutions after applied bias in 24 hours, shown in Figure S3A. The transparent solution was drop-casted on TEM grid and the image was obtained. (B) Histogram of particle sizes shown in (A). Average size was  $104.3 \pm 16.8$  nm.



**Figure S7.** PL spectra of the white precipitate on film in Figure S4D with different excitation wavelength (a: 280 nm, b: 310 nm, c: 360 nm).



**Figure S8.** Deconvolutions of PL spectra from Figure S4 with different excitations (from top to bottom, 280 nm, 310, and 360 nm). From left to light dashed line indicates PL peaks from PbBr<sub>2</sub>, PbBr<sub>4</sub><sup>2-</sup>, and PbBr<sub>3</sub><sup>-</sup>.