

Electronic Supplementary Information

Highly luminescent perovskite quantum dots for light-emitting devices: Photopatternable perovskite quantum dot–polymer nanocomposites

Cheng-Han Sung,^a Shi-Da Huang,^a Gautham Kumar,^a Wen-Chi Lin,^a Chien-Chung Lin,^b Hao-Chung Kuo,^{ac} and Fang-Chung Chen^{*ad}

^a*Department of Photonics, College of Electrical and Computer Engineering, National Yang Ming Chiao Tung University, Hsinchu 30010, Taiwan*

^b*Graduate Institute of Photonics and Optoelectronics, Department of Electrical Engineering, National Taiwan University, Taipei 10617, Taiwan*

^c*Semiconductor Research Center, Hon Hai Research Institute, Taipei 11492, Taiwan*

^d*Center for Emergent Functional Matter Science, National Yang Ming Chiao Tung University, Hsinchu 30010, Taiwan*

E-mail: fcchendop@nycu.edu.tw, fcchen@mail.nctu.edu.tw

Synthesis of FAPbBr₃ QDs

PeQDs: The FAPbBr₃ QDs were synthesized by following procedures reported previously, with some modification.^[1] First, precursor solutions were prepared in a glove box at room temperature. Solution A was prepared by dissolving formamidinium bromide (FABr, 0.16 mmol) in DMF (500

μL , 0.32 M). Solution B was prepared by dissolving lead(II) bromide (PbBr_2 , 0.20 mmol) in DMF (500 μL , 0.40 M). Solution C was prepared by dissolving PbBr_2 (1.5 mmol) in a mixture of propionic acid, butylamine, and hexane (1:1:1, v/v/v). All of the solutions were stirred in a glove box overnight. Then, oleic acid (OA, 500 μL), octylamine (40 μL), and solution B were mixed with solution A at room temperature. The resulting mixture was slowly added dropwise into a beaker containing toluene (10 mL) under vigorous stirring. After continuous stirring for 5 min, acetonitrile (5 mL) was added. The solution was removed from the glove box and centrifuged (6000 rpm, 5 min). The resulting precipitate was redispersed in toluene (10 mL). The PLQY of the FAPbBr_3 QDs in toluene was $80 \pm 2\%$.

Post-treatment of QDs: All of the steps for post-treatment of the PeQDs were implemented open to the air at room temperature. First, solution C was added into the solution of the FAPbBr_3 QDs. After stirring for 5 min, OA (500 μL) and methyl acetate (10 mL) were added sequentially. The solution was centrifuged (8000 rpm, 25 min) and the precipitate re-dispersed in toluene (5 mL). The QD solution in toluene was further centrifuged (8000 rpm, 15 min). Finally, the supernatant was collected and a highly luminescent powder was obtained after evaporating the solvent. The PLQY of the FAPbBr_3 QDs in toluene had improved to $96 \pm 2\%$ after post-treatment.

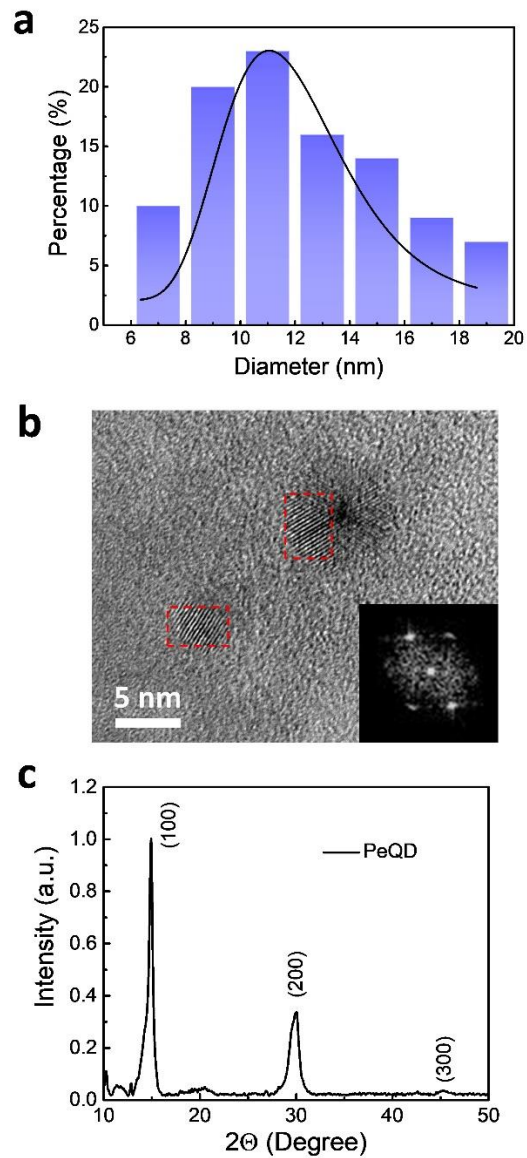


Figure S1. The properties of the FAPbBr₃ QDs. (a) The size distribution for the FAPbBr₃ QDs shown in Figure 1. (b) HRTEM image of the QDs. Two red squares highlight the QDs. The inset at the bottom right corner is the corresponding FFT image. (c) The XRD spectrum of the FAPbBr₃ QDs.

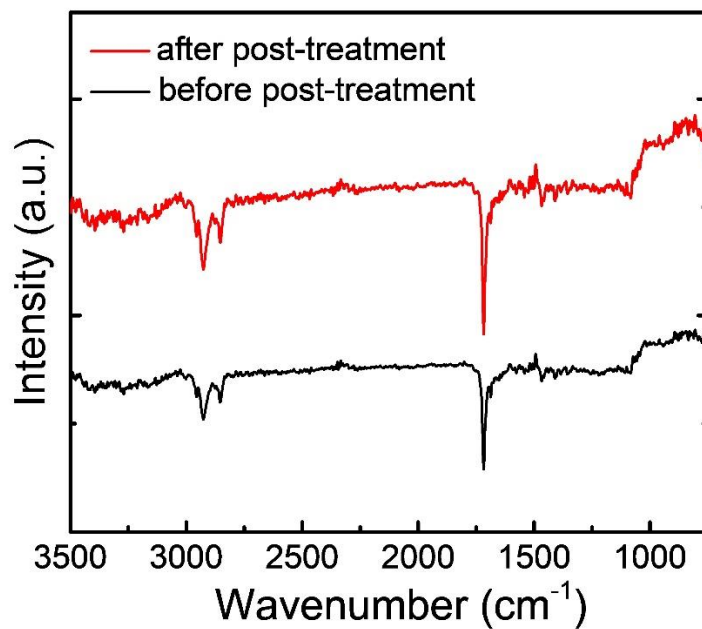


Figure S2. The FTIR spectra of the PeQDs prepared before and after post-treatment.

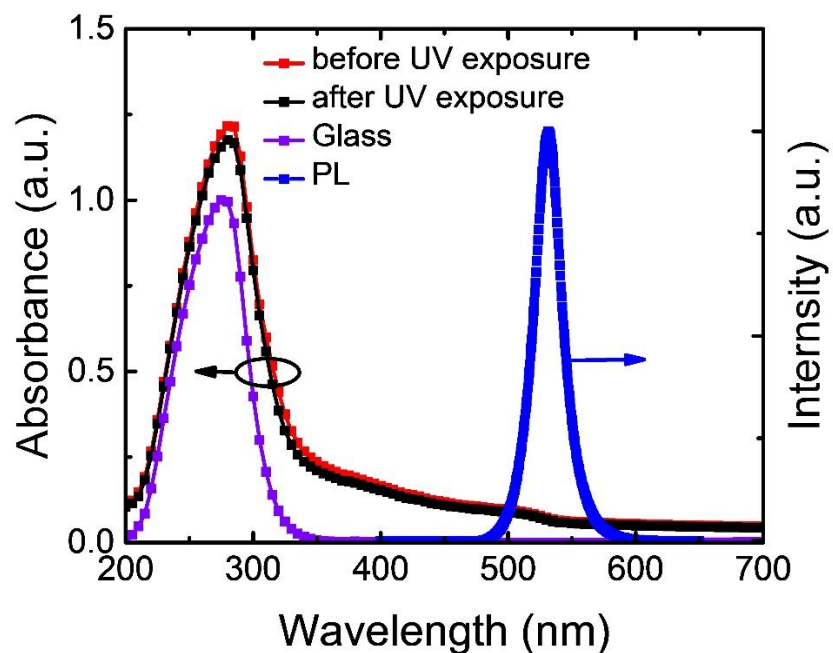


Figure S3. The PL and absorption spectra of the PeQD-PNC films prepared before and after UV exposure.

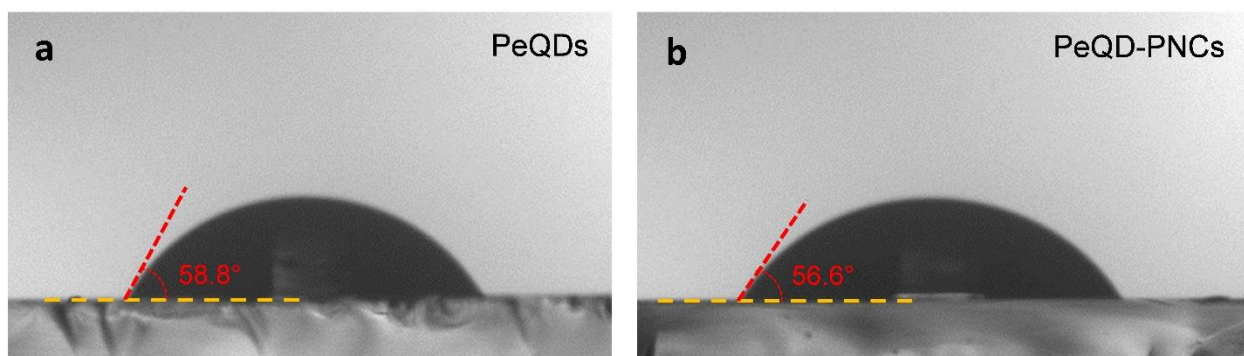


Figure S4. The results of contact angel measurements. The films are (a) neat FAPbBr₃ QDs and (b) The PeQD-PNC film. The liquid used was water.

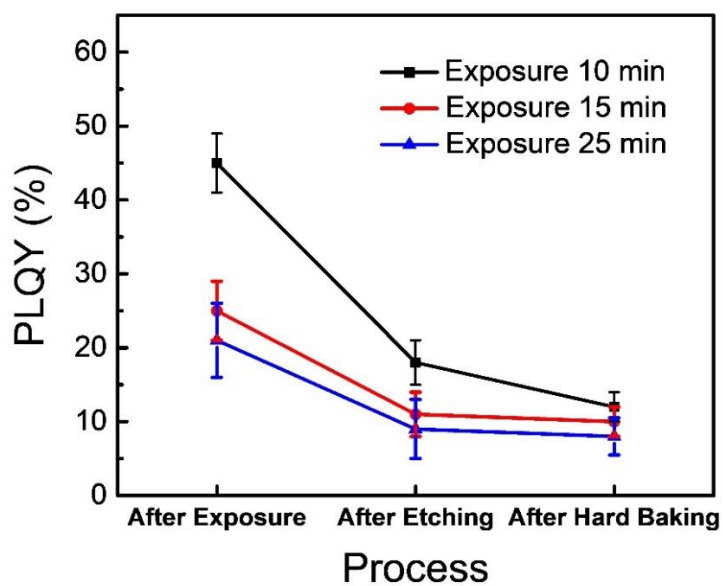


Figure S5. PLQYs of PeQD-PNC films prepared with various UV exposure times, measured at different stages during the photolithography process.

Reference

1. F. Di Stasio, I. Ramiro, Y. Bi, S. Christodoulou, A. Stavrinadis, G. Konstantatos, *Chem. Mater.* **2018**, 30, 6231–6235.