

## Supplementary Information

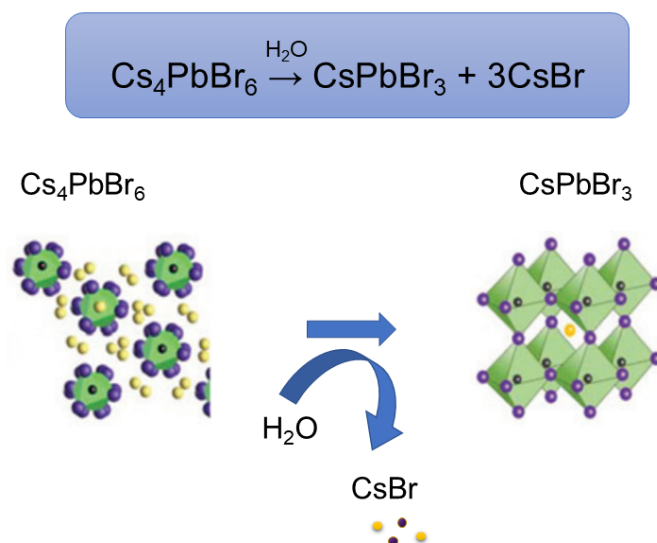
### Turn-on Fluorescence Humidity Sensing Based on Cs<sub>4</sub>PbBr<sub>6</sub> Nanocrystal Array

*Yelu Wei,<sup>a</sup> Yang Liu,<sup>a</sup> Yuchen Zhang,<sup>a</sup> Jiahao Pan,<sup>a</sup> Shuhan Pan,<sup>a</sup> Ying Wei,<sup>a</sup> Bingcai Pan,<sup>b</sup> Zhenda Lu<sup>\*ab</sup> and Xing Xing<sup>\*ab</sup>*

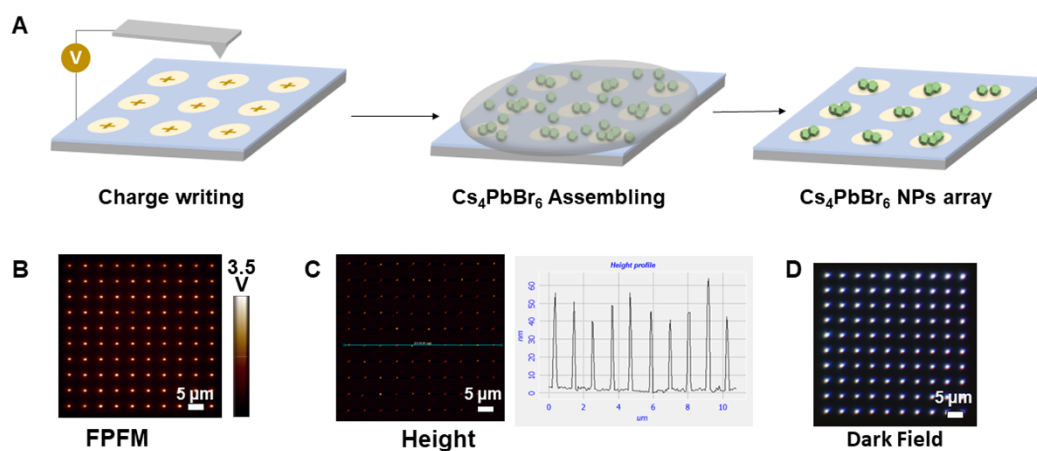
<sup>a</sup>College of Engineering and Applied Sciences, State Key Laboratory of Analytical Chemistry for Life Science, and Jiangsu Key Laboratory of Artificial Functional Materials, Nanjing University, Nanjing 210023, China

<sup>b</sup>School of the Environment, Research Center for Environmental Nanotechnology (ReCENT), Nanjing University, Nanjing 210023, China

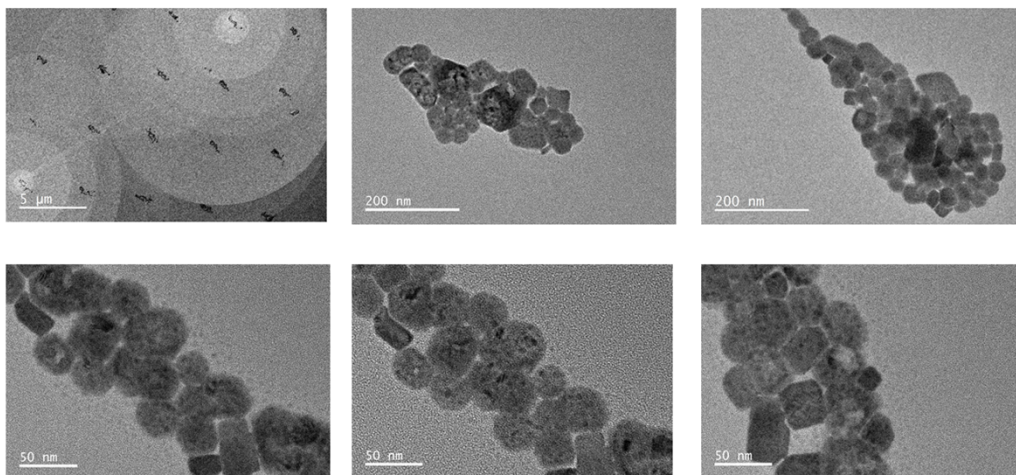
\*E-mail: luzhenda@nju.edu.cn; xxing90@foxmail.com



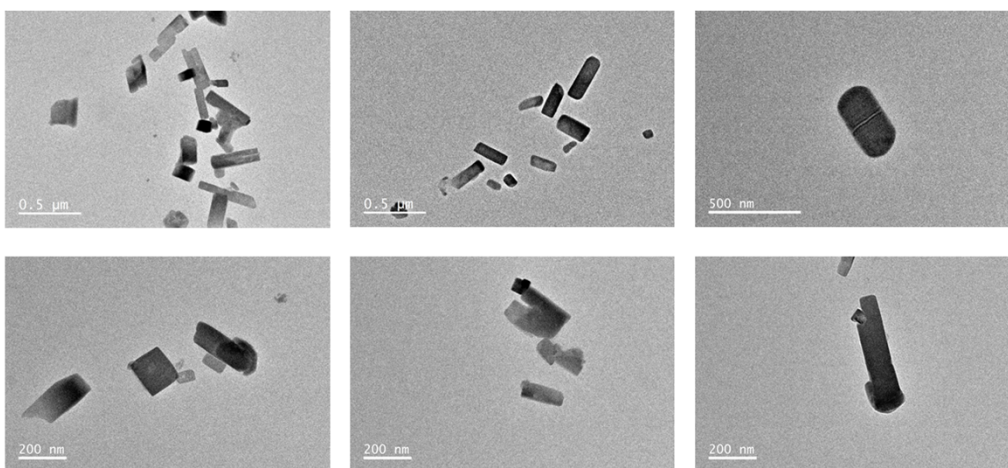
**Fig. S1.** The Schematic illustration of crystal structure change and transformation process from  $\text{Cs}_4\text{PbX}_6$  to  $\text{CsPbX}_3$  after water treatment.



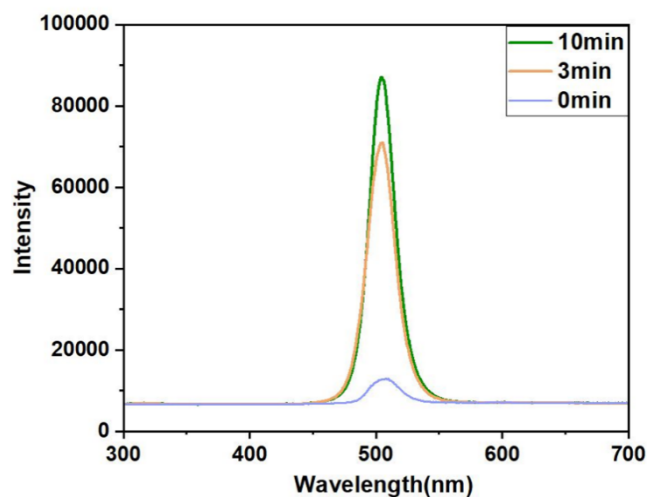
**Fig. S2.** Fabrication process for the  $\text{Cs}_4\text{PbBr}_6$  nanoparticles (NPs) array using a modified AFM nanoxerography technique. (A) The schematic diagram of assembly process which consists of two steps: charge writing and  $\text{Cs}_4\text{PbBr}_6$  NPs assembly. (B) Surface potential characterization using KPFM scanning of AFM. (C) Height scan of  $\text{Cs}_4\text{PbBr}_6$  NPs array after assembly and its corresponding height distribution on the left line. (D) Dark field imaging of  $\text{Cs}_4\text{PbBr}_6$  NPs array after assembly.



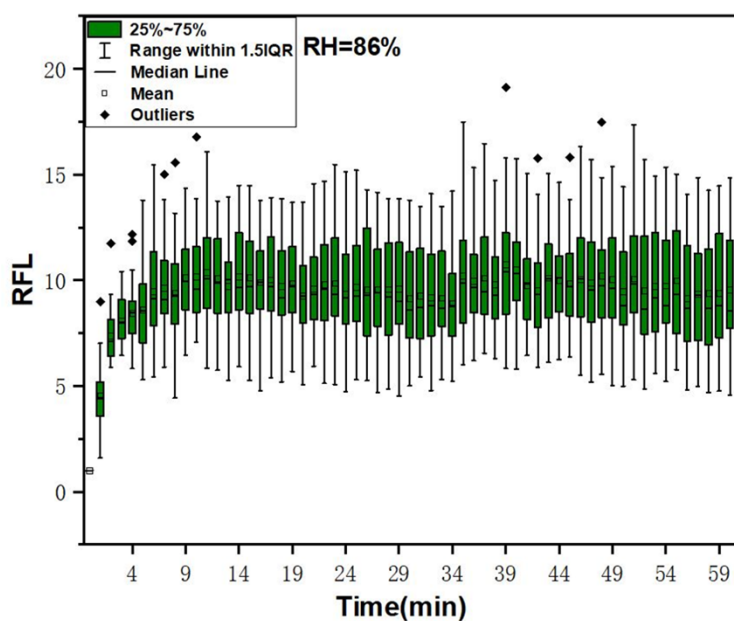
**Fig. S3.** TEM images of Cs<sub>4</sub>PbBr<sub>6</sub> NPs array before exposed to water.



**Fig. S4.** TEM image of CsPbBr<sub>3</sub> array transformed by Cs<sub>4</sub>PbBr<sub>6</sub> NPs array after exposed to 70% humidity for 10 minutes



**Fig. S5.** The spectrums over time at a relative humidity of 80%.



**Fig. S6.** Box plot the relative fluorescence intensity (RFI) for the entire duration of 60 minutes.