Supplementary Information

Turn-on Fluorescence Humidity Sensing Based on Cs$_4$PbBr$_6$

Nanocrystal Array

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**Fig. S1.** The Schematic illustration of crystal structure change and transformation process from Cs₄PbX₆ to CsPbX₃ after water treatment.

**Fig. S2.** Fabrication process for the Cs₄PbBr₆ nanoparticlas (NPs) array using a modified AFM nanoxerography technique. (A) The schematic diagram of assembly process which consists of two steps: charge writing and Cs₄PbBr₆ NPs assembly. (B) Surface potential characterization using KPFM scanning of AFM. (C) Height scan of Cs₄PbBr₆ NPs array after assembly and its corresponding height distribution on the left line. (D) Dark field imaging of Cs₄PbBr₆ NPs array after assembly.
Fig. S3. TEM images of Cs$_4$PbBr$_6$ NPs array before exposed to water.

Fig. S4. TEM image of CsPbBr$_3$ array transformed by Cs$_4$PbBr$_6$ 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.