Electronic supplementary information for

Photo-induced Dual Passivation via Usanovich Acid-Base on Surface Defects of

Methylammonium Lead Triiodide Perovskite

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1. Original PL decay data of materials before and after p-BQ treatment

Figure S1. Original PL decay data of MAPbI₃ in N_2 before and after p-BQ treatment. PL lifetime in N_2 of p-BQ treated MAPbI₃ (~4 ns) was on average one order of magnitude shorter than that of pristine crystals (~40 ns).

2. PL spectra of MAPbI₃ films in different atmospheres



Figure S2. Spectra of p-BQ treated MAPbI₃ in N_2 , O_2 , acetone and acetonitrile atmospheres and spectra of pristine MAPbI₃ in N_2 and O_2 atmospheres. No significant spectral change was observed.

3. Passivation effect of acetonitrile



Figure S3. Acetonitrile (denoted AN) showed PL enhancement and passivation effect on p-BQ treated MAPbI₃ similar to O₂ and acetone.

4. Comparison of PL intensity between illuminated and unilluminated area for acetone passivation



Figure S4. PL intensity comparison between illuminated and unilluminated area after acetone passivation.

5. No passivation effect from petroleum ether



Figure S5. PL intensity of p-BQ treated MAPbI₃ film with atmosphere switched between N₂ and petroleum ether (denoted PE). No PL enhancement was observed.

6. Degradation of p-BQ treated MAPbI₃ observed under bright field.



Figure S6. Image taken under bright field (a) before and (b) after degradation caused

by acetone and O_2 under irradiation.

7. Degradation of $MAPbI_3$ caused by acetonitrile and O_2



Figure S7. PL intensity of p-BQ treated MAPbI₃ film with the atmosphere switched between N_2 , O_2 and acetonitrile- O_2 hybrid atmosphere (denoted AN- O_2). Significant degradation of MAPbI₃ was observed in acetonitrile- O_2 hybrid atmosphere.

8. No degradation was observed in petroleum ether and O₂ hybrid atmosphere



Figure S8. PL intensity of p-BQ treated MAPbI₃ film with atmosphere switched between N_2 , O_2 and petroleum ether- O_2 hybrid atmosphere (denoted as PE- O_2). No degradation of MAPbI₃ was observed in petroleum ether- O_2 hybrid atmosphere.