# Supporting Information

# Trap States Passivation and Photoactivation in Wide Band Gap Inorganic Perovskites Semiconductors

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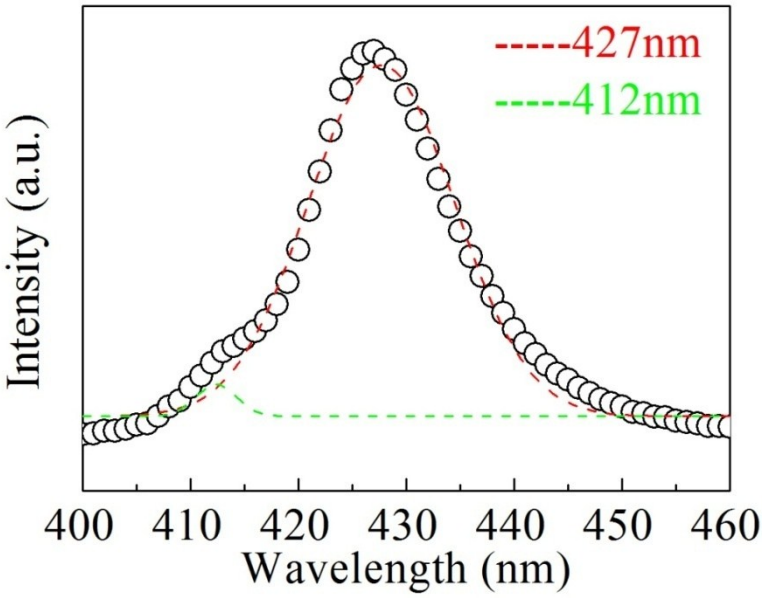


**Figure S1. PL spectrum and Gaussian deconvolution of $CsPbBr_3$ nanocrystals.**

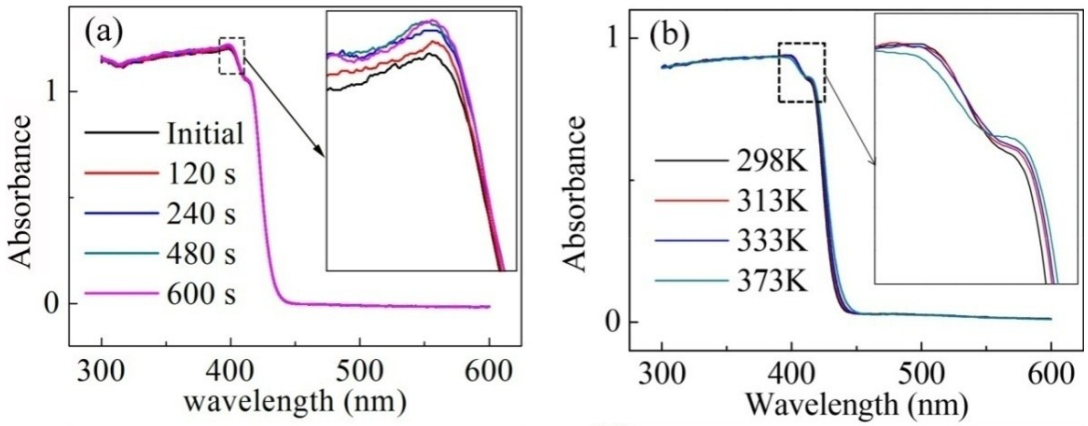


**Figure S2. (a) and (b) are absorption spectra curves of $CsPbCl_3$ microcrystals with $CsCl/PbCl_2$ molar ratio of 1 after different illumination time and at different temperatures, respectively. The inset in (a) and (b) is an enlargement of absorption spectra above band gap.**

Figure S2(a) shows the optical absorption spectra of $CsPbCl_3$ microcrystals after different illumination times by 350 nm UV light. The bandgap of $CsPbCl_3$ microcrystals is 2.9eV. The optical energy absorption above the band gap is enhanced

with increasing UV light irradiation time, as shown in inset in Figure S2(a). In order to exclude the possibility that the heat produced by continuous light irradiation causes an enhancement in the absorption coefficient, the optical absorption spectra at different temperatures were measured, as shown in the Figure S2(b). It can be seen that the absorption spectrum curve is red shifted with increasing temperature. Thus, we can rule out the possibility that the increase of temperature causes small change in the absorption in Figure S2(a), because no red shift was observed in the absorption spectrum curves. More importantly, with the increase of temperature, the absorption at energy above the band gap decreases. When the temperature of $CsPbCl_3$ microcrystals remains almost constant, the enhancement of absorption after continuous light irradiation can be attributed to the trap filling. The trap states located within the band gap are filled with increasing irradiation time. More electrons from valence band can be excited to the conduction band, otherwise occupies the sub-gap trap states. As a result, the absorption at energy above the band gap is enhanced.