Reversible Luminescence Photoswitching of Colloidal $CsPbBr_3$ Nanocrystals Hybridized with a Diarylethene Photoswitch

(Supporting Information)

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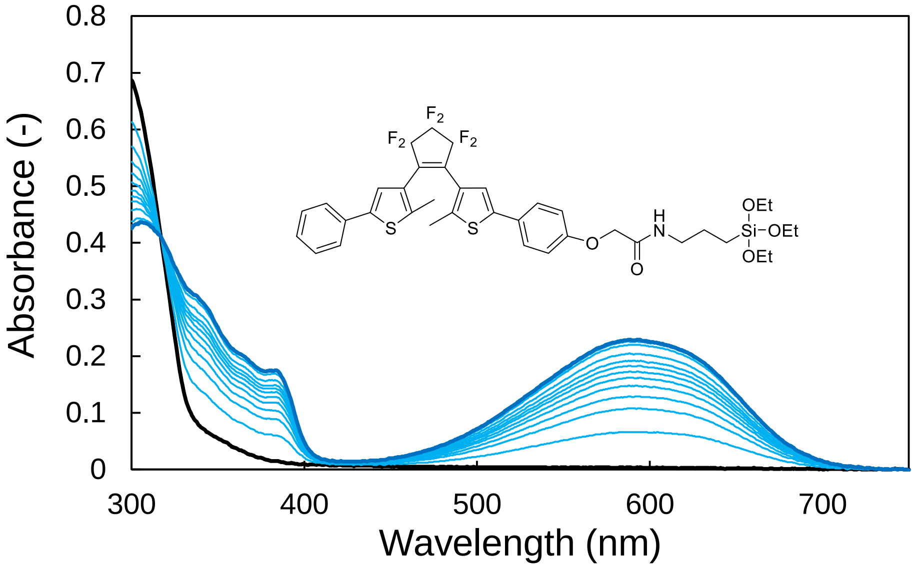


Figure S1. Absorption spectral change of the target DAE **1** upon irradiation with 365 nm UV light; the open-ring isomer (black-line) and PSS under irradiation with 365 nm light (thick blue-line).

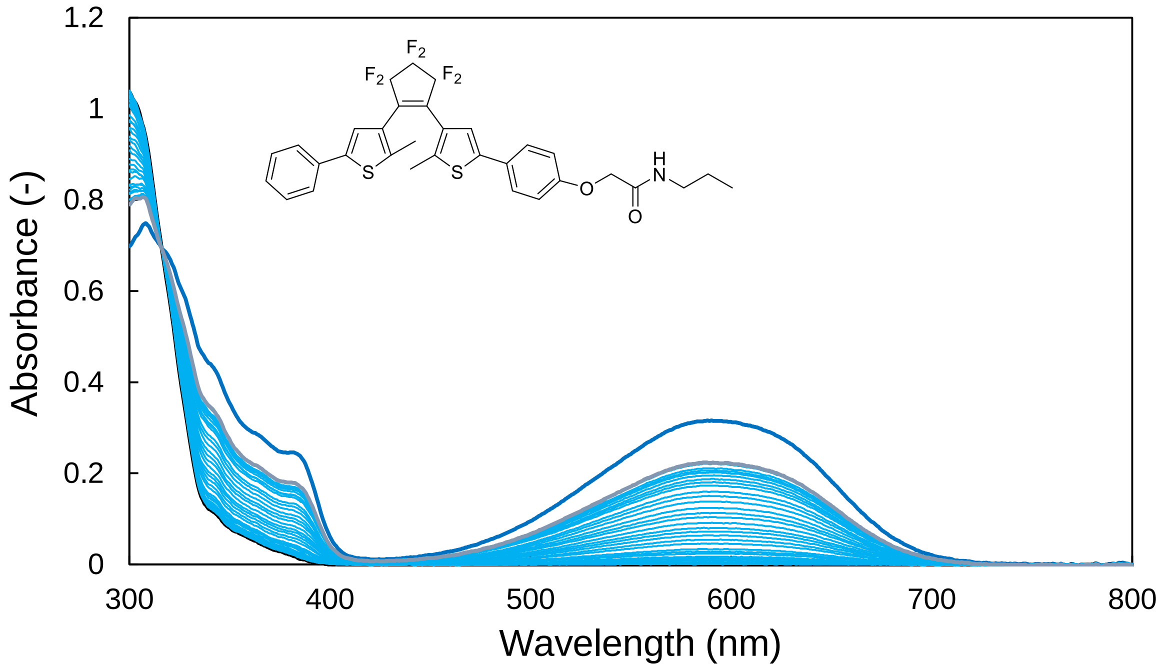
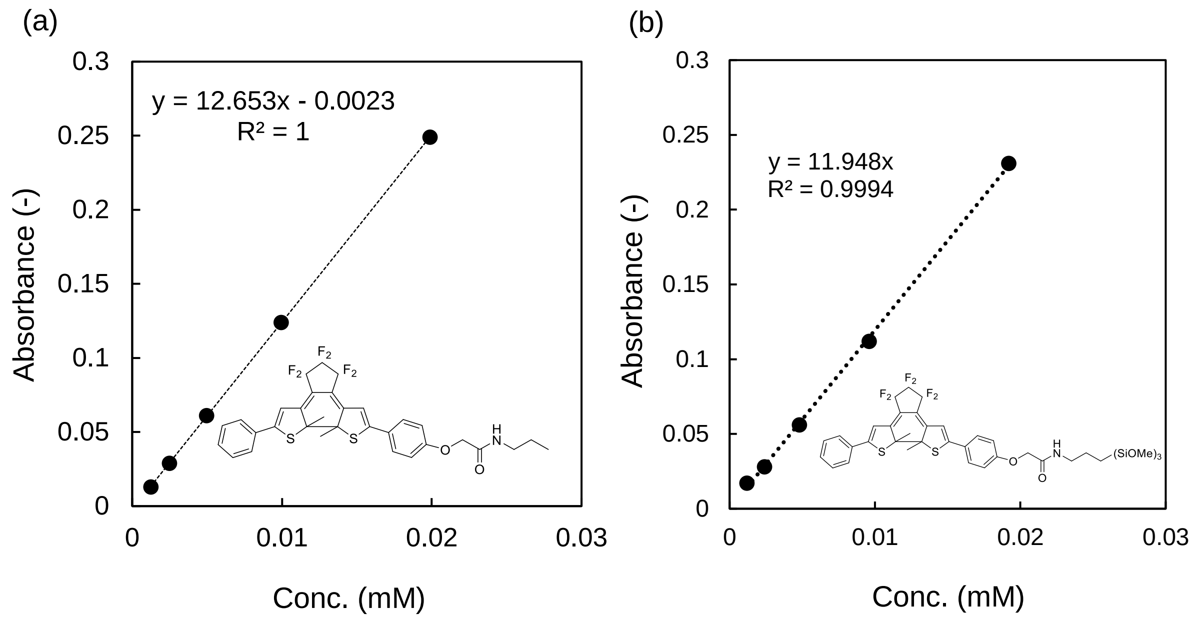


Figure S2. Absorption spectral change of the model DAE **2** upon irradiation with 365 nm UV light; the open-ring isomer (black-line), the pure close-ring isomer (thick blue-line) and PSS under irradiation with 365 nm light (gray-line).



ε = 12653

Conversion at 588 nm: 71%

ε = 11948

Estimated Conversion at 588 nm: 67%

Figure S3. Plots of absorbance as the function of concentrations at PSS; (a) The model DAE **2** and (b) the target DAE **1**.

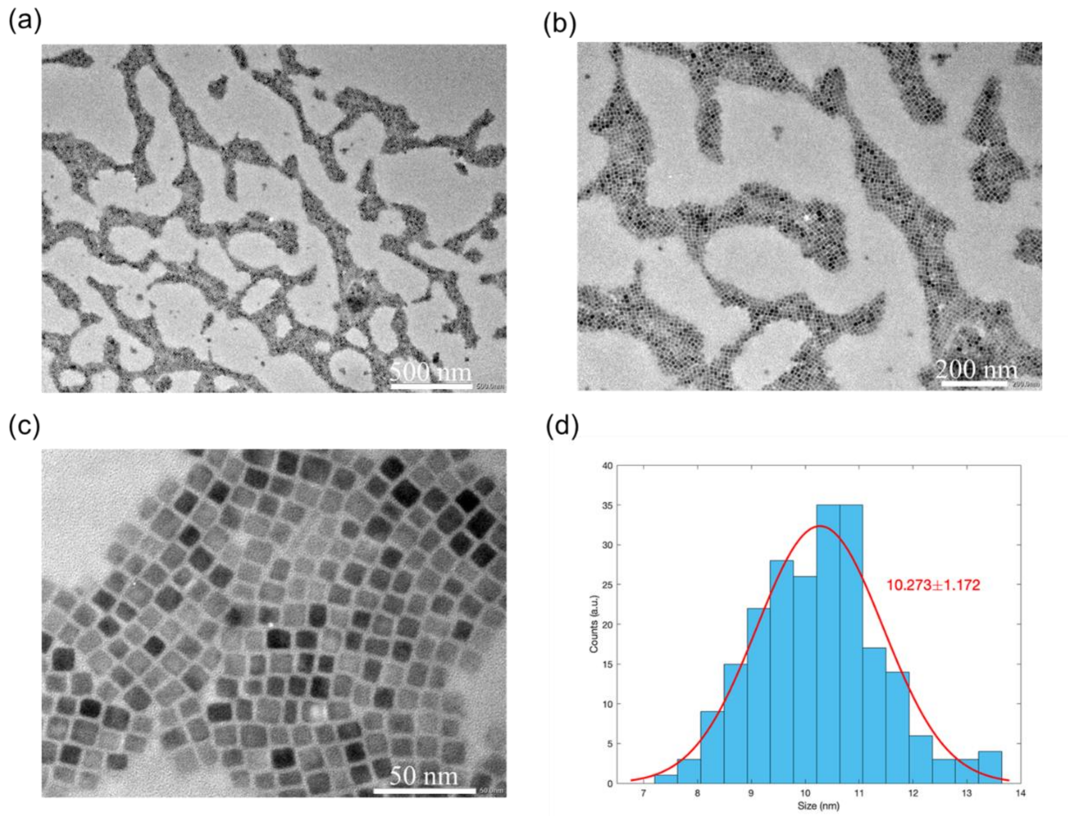


Figure S4. (a-c) TEM images with different magnification ratios and (d) size distribution histogram of the synthesized perovskite $CsPbBr_3$ QDs based on particle size analysis of (c).

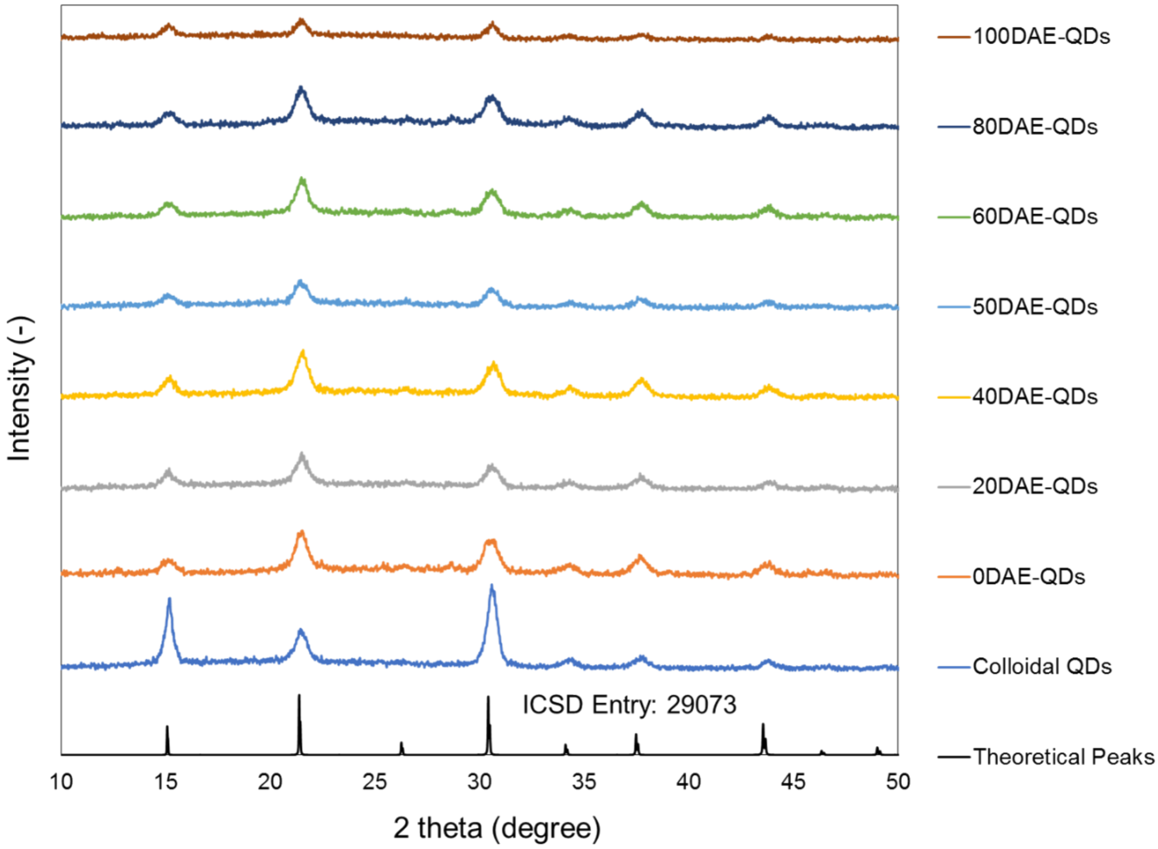


Figure S5. XRD diffraction patterns of colloidal QDs and each DAE-QDs hybrid.

Table S1. Composition of 1 mL of the coating solutions.

Sample Name	Coating Solution Component Ratio (APTES : DAE)	3-Aminotriethoxysilane (APTES)	Diarylethene (DAE) **1**
0DAE-QDs	10:0	21.28 µl (0.10 mmol)	0 mg (0 mmol)
20DAE-QDs	8:2	17.28 µl (0.082 mmol)	14.85 mg (0.019 mmol)
40DAE-QDs	6:4	12.96 µl (0.062 mmol)	29.80 mg (0.037 mmol)
50DAE-QDs	5:5	10.8 µl (0.048 mmol)	36.50 mg (0.046 mmol)
60DAE-QDs	4:6	8.64 µl (0.041 mmol)	43.80 mg (0.055 mmol)
80DAE-QDs	2:8	4.32 µl (0.021 mmol)	59.60 mg (0.075 mmol)
100DAE-QDs	0:10	0 µl (0 mmol)	73.40 mg (0.092 mmol)

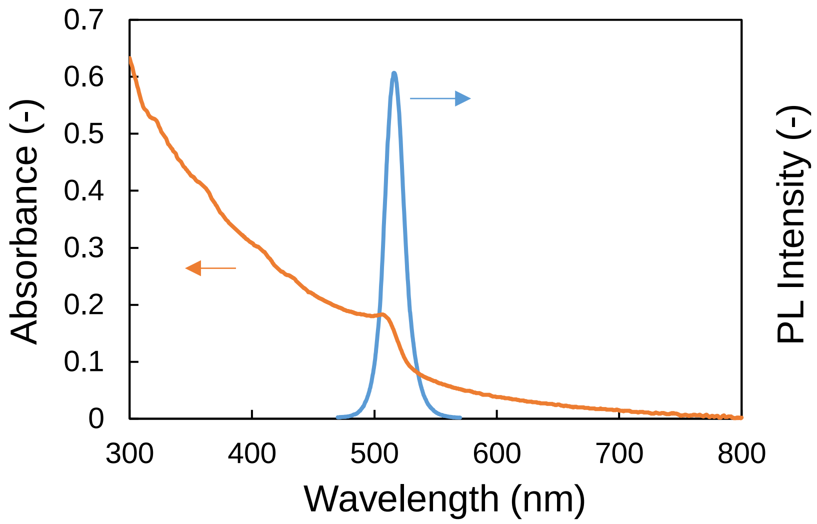


Figure S6. Absorption and PL spectra of the synthesized perovskite $CsPbBr_3$ QDs.

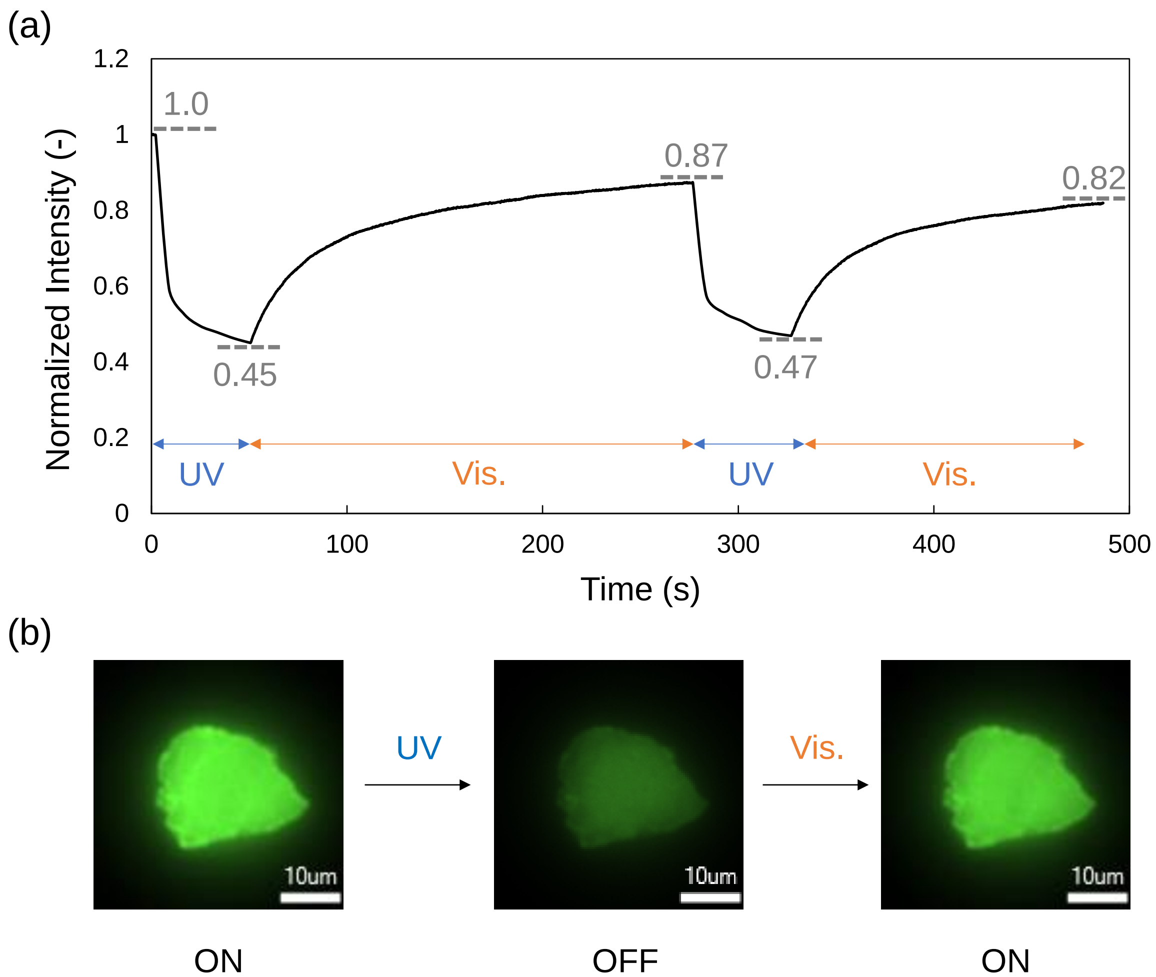


Figure S7. PL switching behavior of a sample (60DAE-QDs) hybridized for 12 h; (a) PL intensity trajectory upon alternate irradiation with UV and visible light (Maximum PL Quenching at 1st cycle: 55%, Recovery (1st cycle): 87%). (b) Luminescence microscopic images of PL photoswitching behavior of 60DAE-QDs hybrids embedded in PMMA film under excitation with 438 nm light (150 μW/cm^2).

Table S2. Elemental analysis of 60DAE-QDs hybrid based on XPS.

Element	Cs	Pb	Br	C	N	O	F	Si
Composition (at %)	2.03	2.35	7.17	62.98	3.5	13.33	2.63	6.01

The ratio of the DAEs in the silica matrix with respect to APTES can be calculated based on atomic ratios of silicon (Si) and fluorine (F) measured by XPS which indicated that approximately 15% of the coating layer was consisted of DAEs.

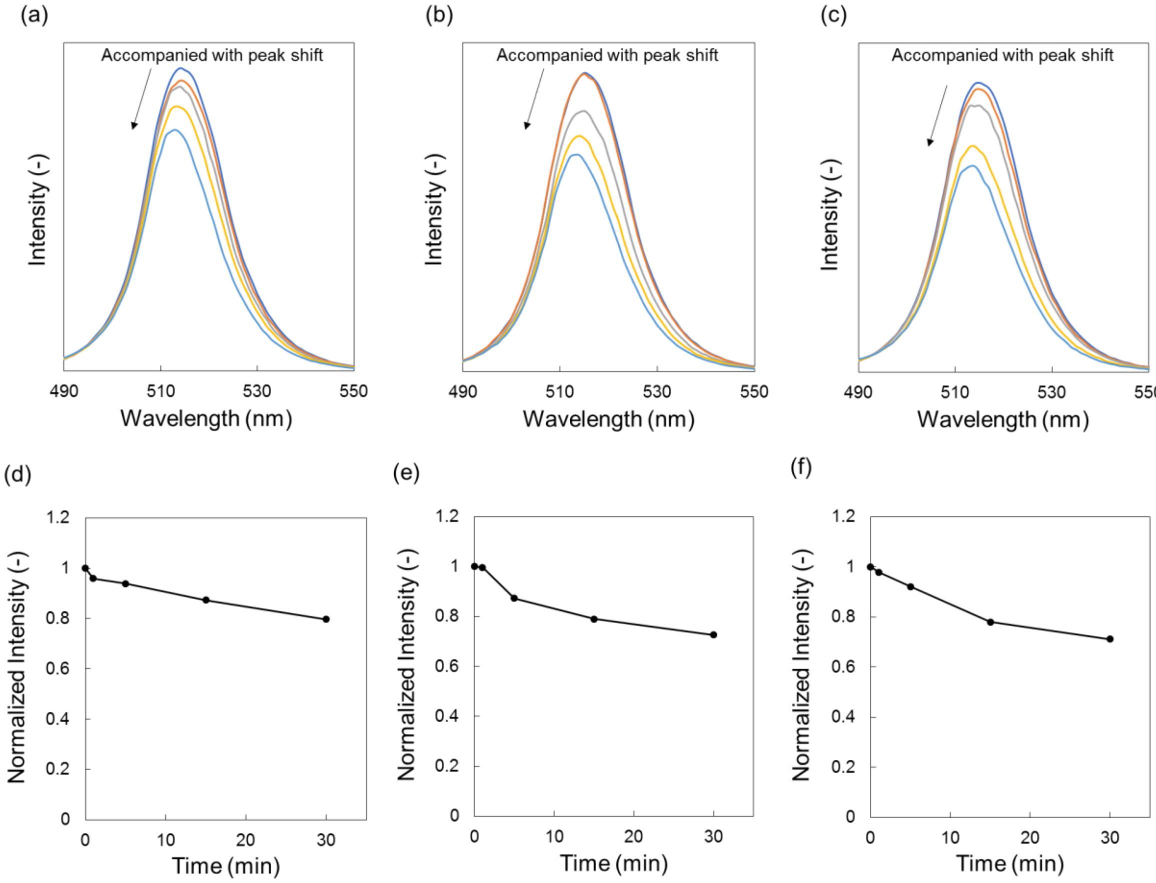


Figure S8. Stability of the synthesized perovskite $CsPbBr_3$ QDs under different environments at dilute concentrations: (a, d) Stability of QDs in a dilute solution under irradiation with visible light (> 600 nm) in toluene, (b, e) stability of QDs in a dilute solution under irradiation with visible light (> 600 nm) in dry toluene and (c, f) stability of QDs in a dilute solution at dark in toluene*.

*The synthesized QDs (dispersed in 5 mL toluene) were approximately diluted 100 fold and then subjected to irradiation of light and analysis.

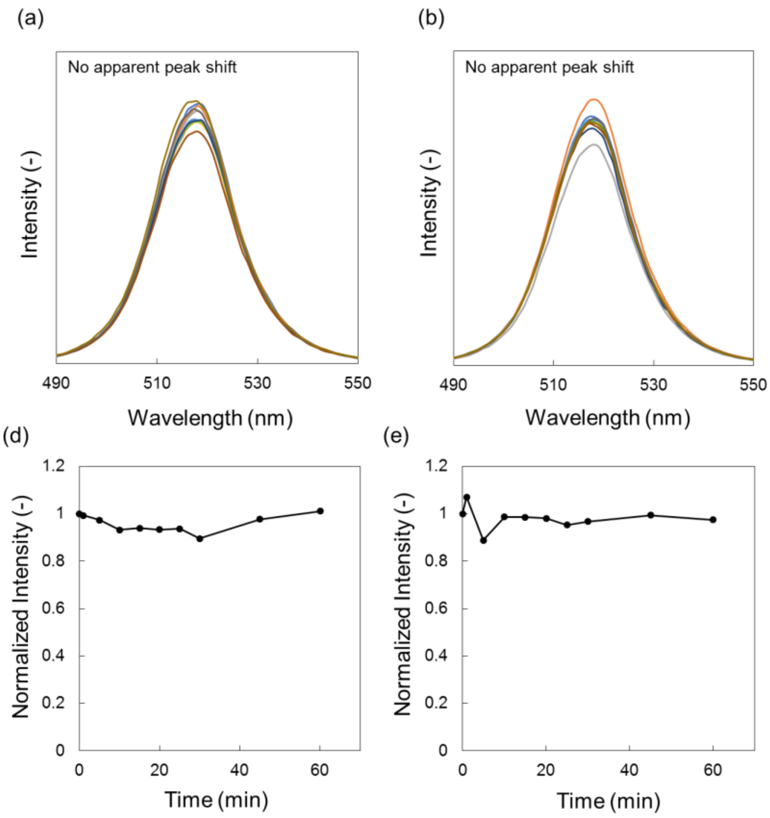


Figure S9. Stability of the synthesized perovskite $CsPbBr_3$ QDs under different environments at concentrated solutions: (a, d) Stability of QDs in a concentrated solution under irradiation with UV light (365 nm) in toluene, (b, e) stability of QDs in a concentrated solution under irradiation with visible light (> 600 nm) in toluene and (c, f) stability of QDs in a concentrated solution (necessary concentration for hybridization reaction) at dark in toluene*.

*The synthesized QDs (dispersed in 5 mL toluene) were subjected to each test and a fraction of each sample was approximately diluted 100 fold immediately before analysis.

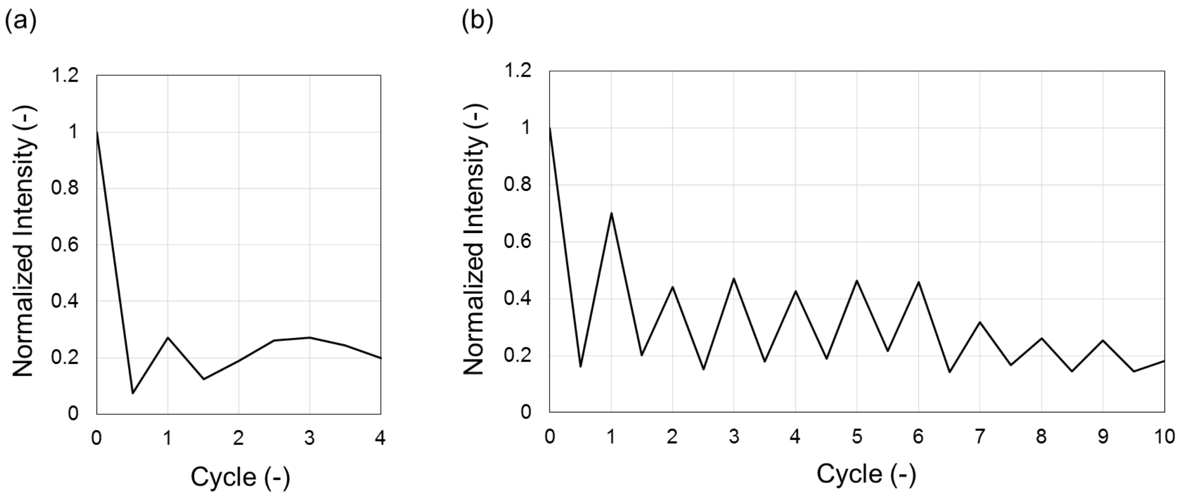


Figure S10. PL switching cycles comparison of two different hybrids upon alternate irradiation of UV (365 nm) and visible light (561 nm) in dilute dispersions: (a) PL switching cycles of a dilute dispersion of 80DAE-QDs and (b) PL switching cycles of a dilute dispersion of 60DAE-QDs.

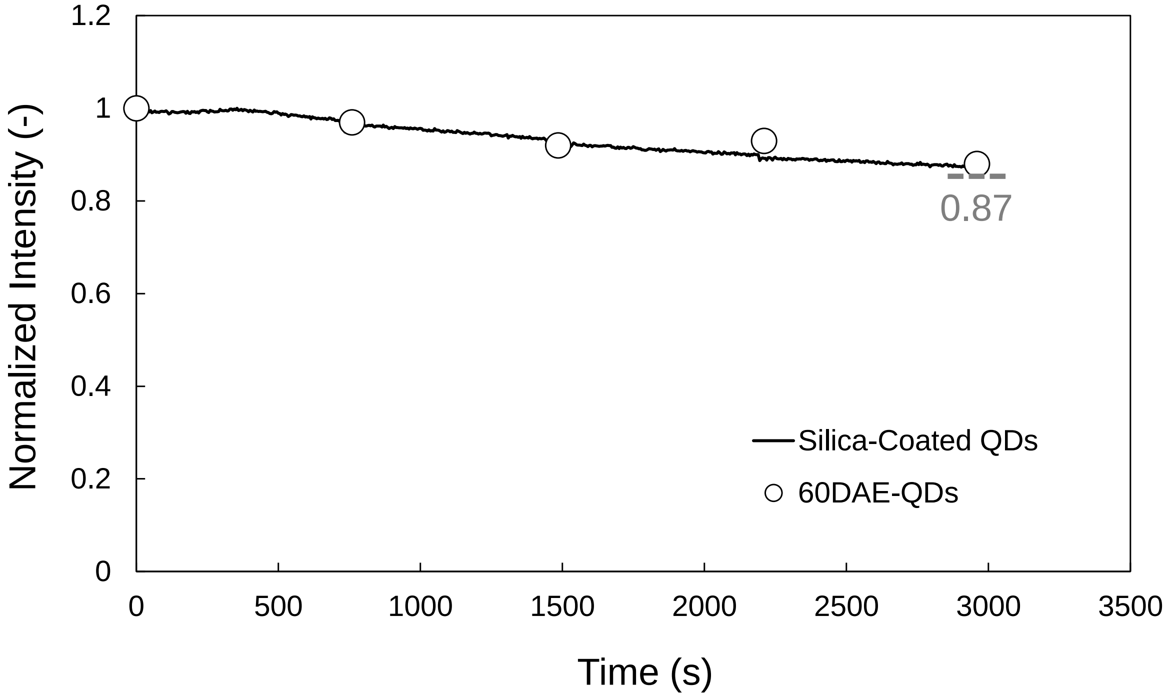


Figure S11. Photostability of silica coated QDs with no DAE in the coat layer; changes in PL intensity in solid thin film under irradiation of light.