

Supporting Information

Synthesis of single CsPbBr₃@SiO₂ core-shell particles via surface activation

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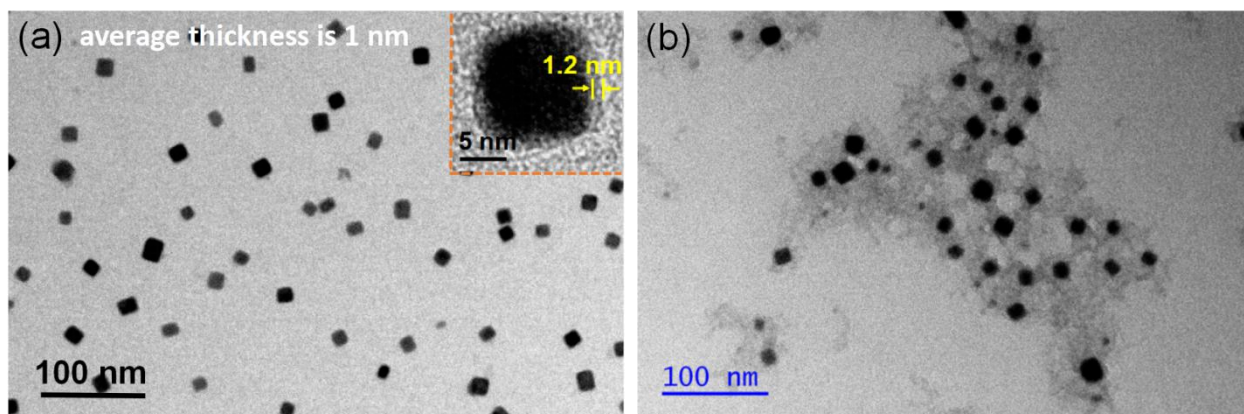


Fig. S1 TEM images of APTES-QDs@SiO₂ obtained by reacting APTES-QDs with (a) 3 μ L TMOS and (b) 12 μ L TMOS (adding 3 μ L per 1 h) for 4 h.

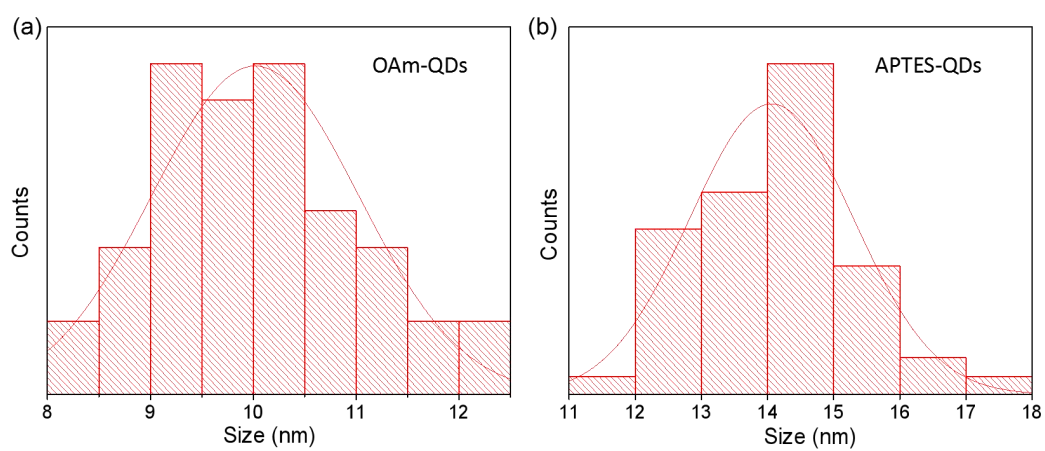


Fig. S2 Size distributions of (a) OAm-QDs, and (b) APTES-QDs.

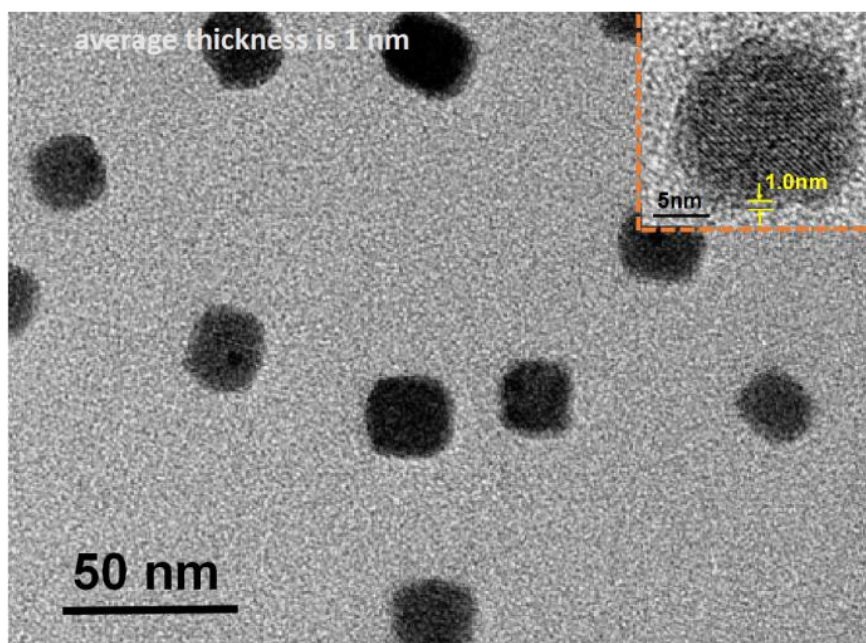


Fig. S3 TEM images of APTES-QDs@SiO₂ obtained by reacting APTES-QDs with 3 μ l TMOS and 15 μ l TEOS for 4 h.

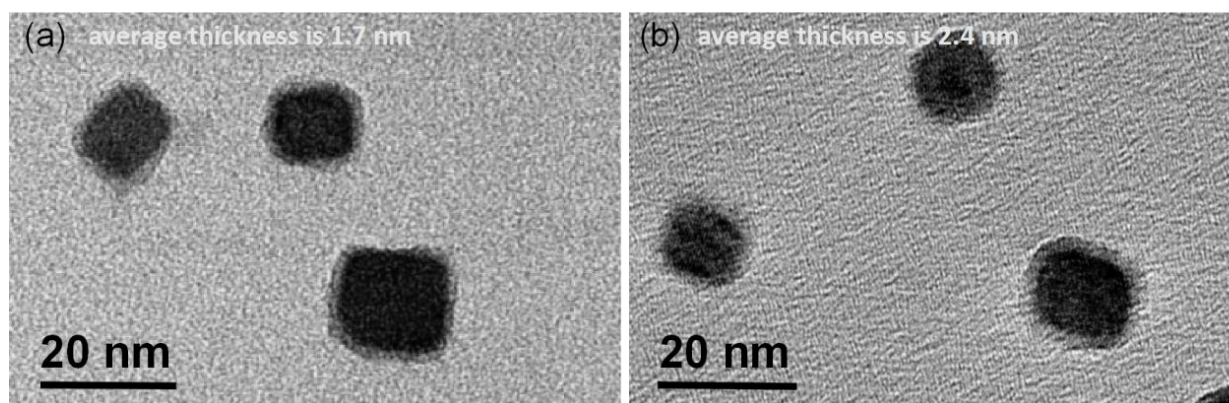


Fig. S4 TEM images of APTES-QDs@SiO₂ obtained by reacting APTES-QDs with 3 μ l TMOS and (a) 150 μ l TEOS, and (b) 450 μ l TEOS for 4 h.

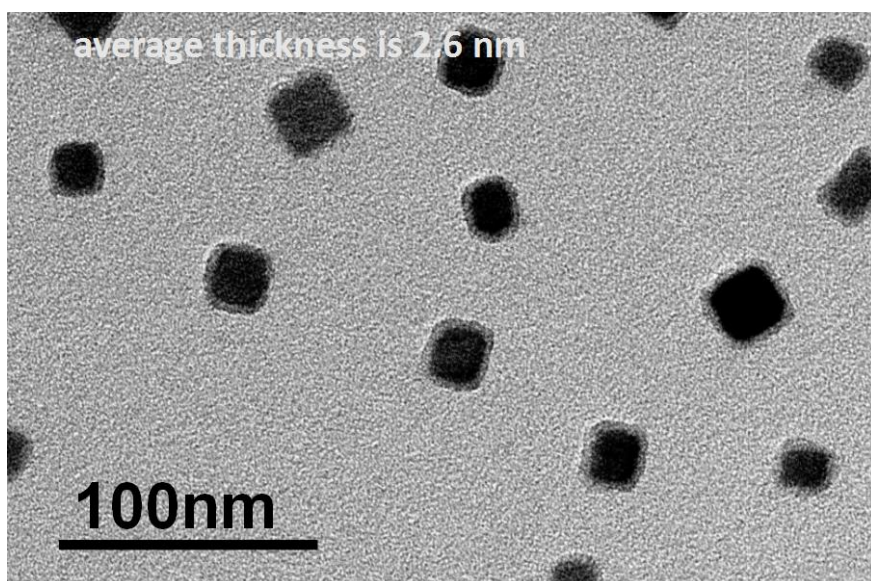


Fig. S5 TEM images of APTES-QDs@SiO₂ obtained by reacting APTES-QDs with 3 μ l TMOS and 450 μ l TEOS for 72 h.

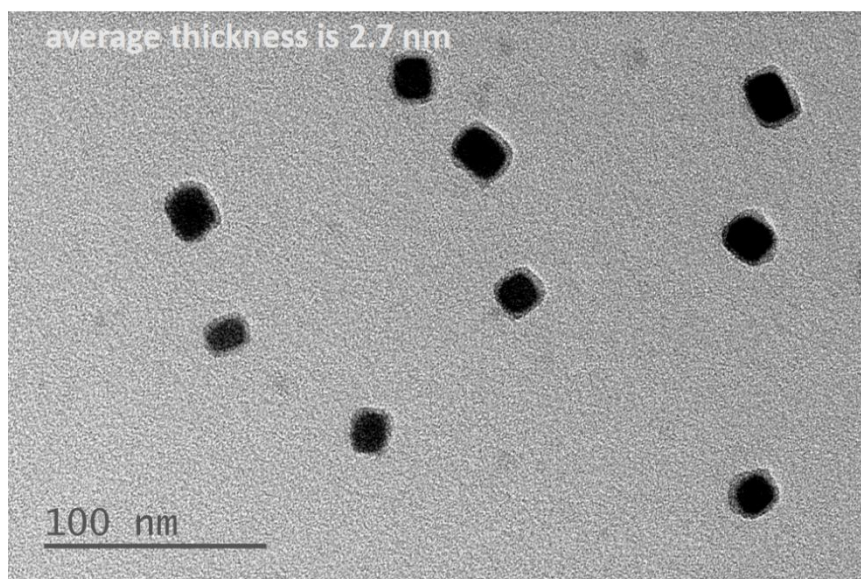


Fig. S6 TEM images of APTES-QDs@SiO₂ obtained by reacting APTES-QDs with 3 μ l TMOS and 2.4 ml TEOS for 72 h.

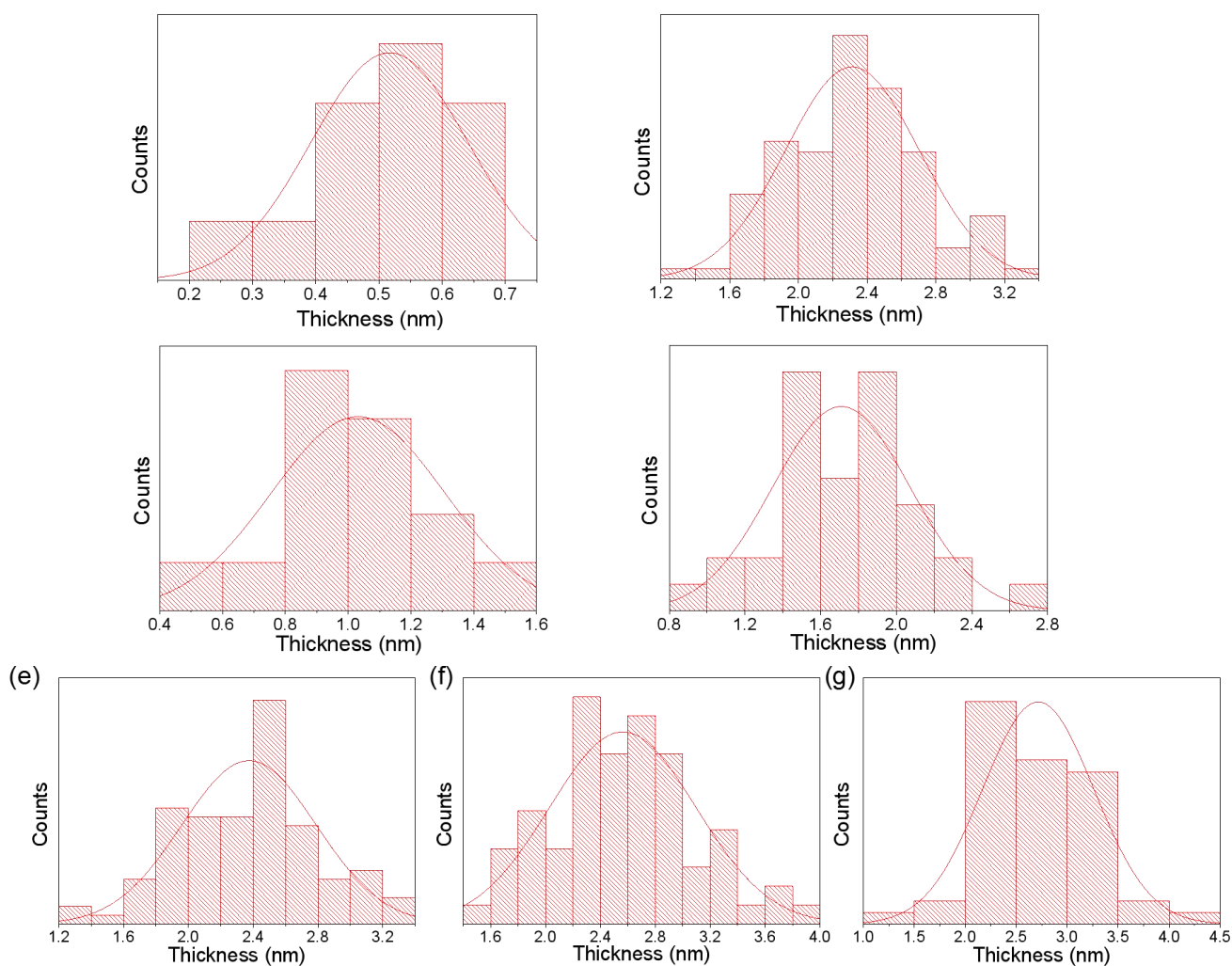


Fig. S7 Thickness distributions of SiO₂ obtained by reacting APTES-QDs with (a) 3 ul TMOS for 1 h, (b) 3 ul TMOS and 300 ul TEOS for 4 h, (c) 3 ul TMOS and 15 ul TEOS for 4 h, (d) 3 ul TMOS and 150 ul TEOS for 4 h, (e) 3 ul TMOS and 450 ul TEOS for 4 h, (f) 3 ul TMOS and 450 ul TEOS for 72 h, and (g) 3 ul TMOS and 2.4ml TEOS for 72 h.

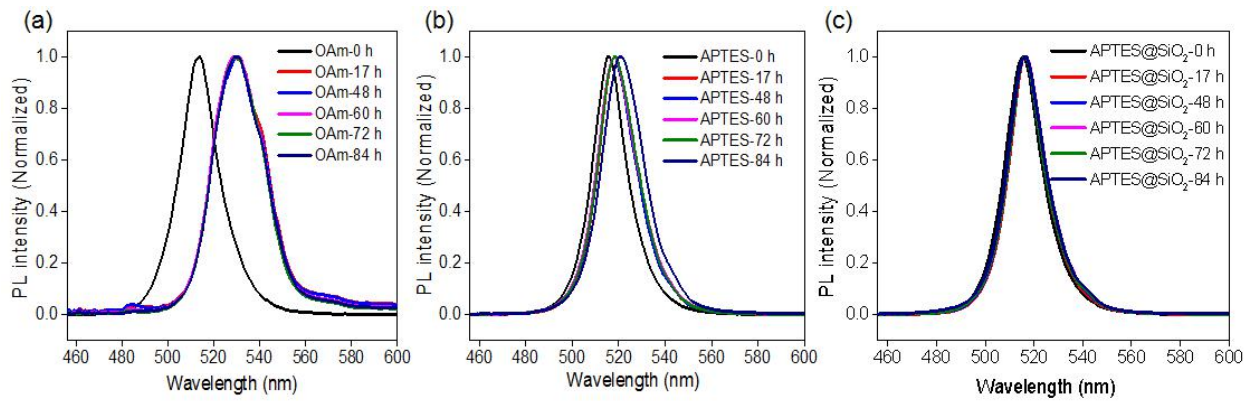


Fig. S8 PL curves of the (a) OAm-QDs, (b) APTES-QDs, and (c) APTES-QDs@SiO₂ films after being treated at 60 °C for a different time. The additional peak at 481nm in Fig. (a) was due to the glass substrate, not a new luminescence peak.

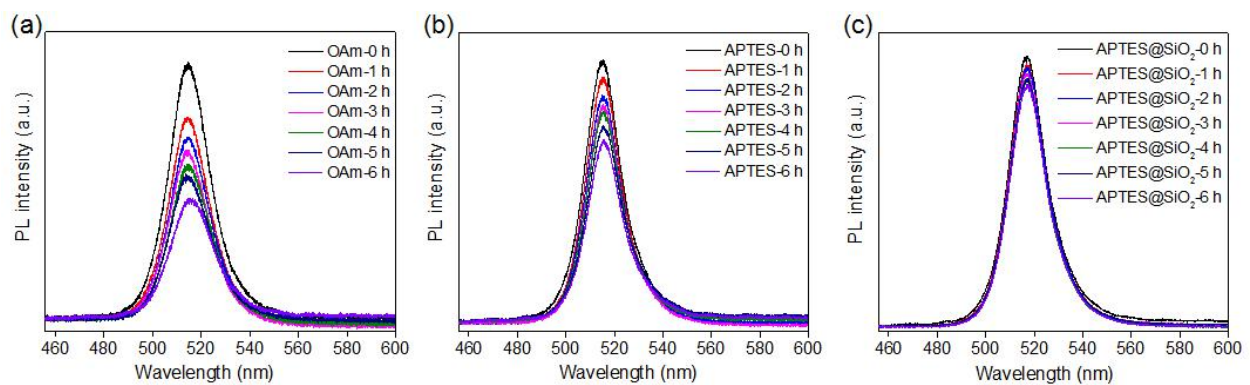


Fig. S9 PL curves of the (a) OAm-QDs, (b) APTES-QDs, and (c) APTES-QDs@SiO₂ films stored in a constant environment (25 °C and humidity of 70%) for a short time.

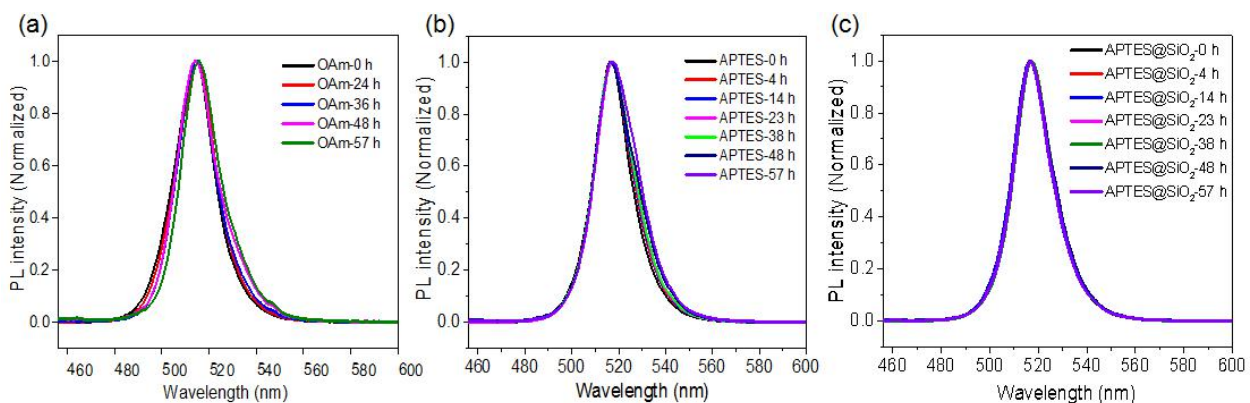


Fig. S10 PL curves of the (a) OAm-QDs, (b) APTES-QDs, and (c) APTES-QDs@SiO₂ films stored in a constant environment (25 °C and humidity of 70%) for a long time.

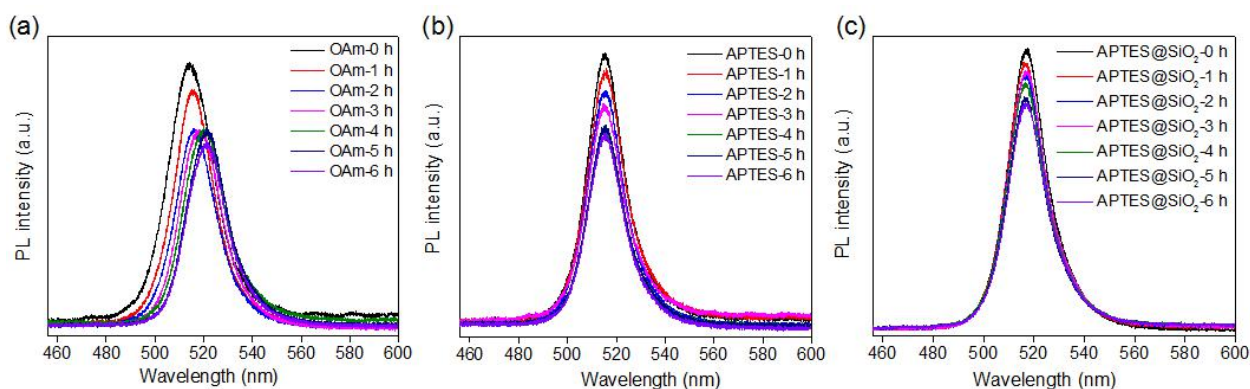


Fig. S11 PL curves of the (a) OAm-QDs, (b) APTES-QDs, and (c) APTES-QDs@SiO₂ films under UV light (365 nm, 80 mW cm⁻²) irradiation for a short time.

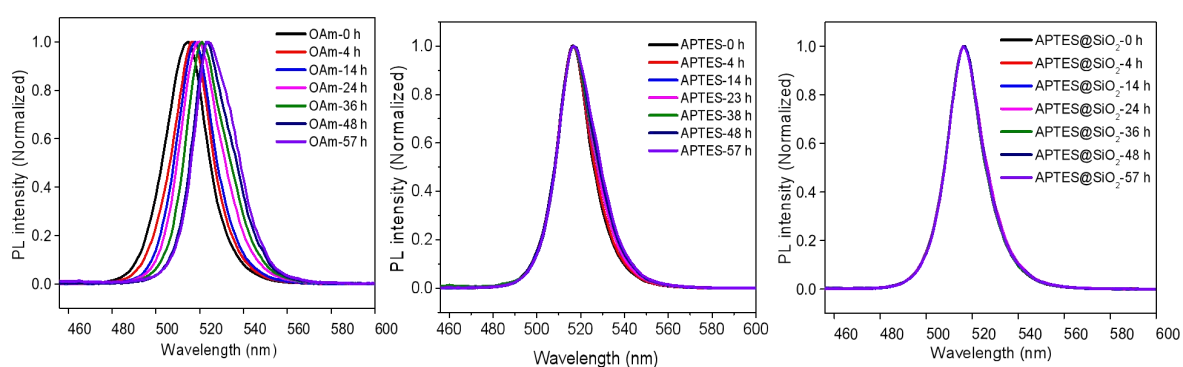


Fig. S12 PL curves of the (a) OAm-QDs, (b) APTES-QDs, and (c) APTES-QDs@SiO₂ films under UV light (365 nm, 80 mW cm⁻²) irradiation for a long time.

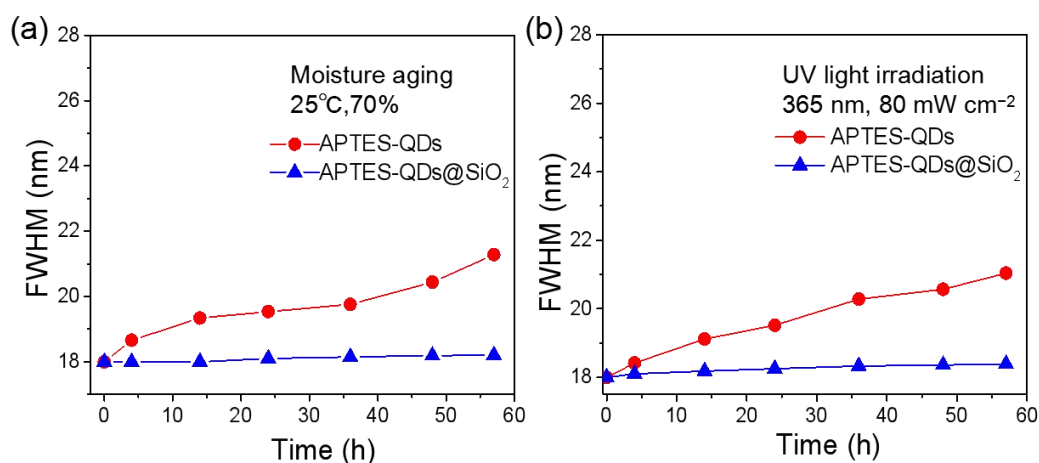


Fig. S13 FWHM of APTES-QDs, and APTES-QDs@SiO₂ films (a) stored in a constant environment (25 °C and humidity of 70%), and (e) under UV light (365 nm, 80 mW cm⁻²) irradiation.

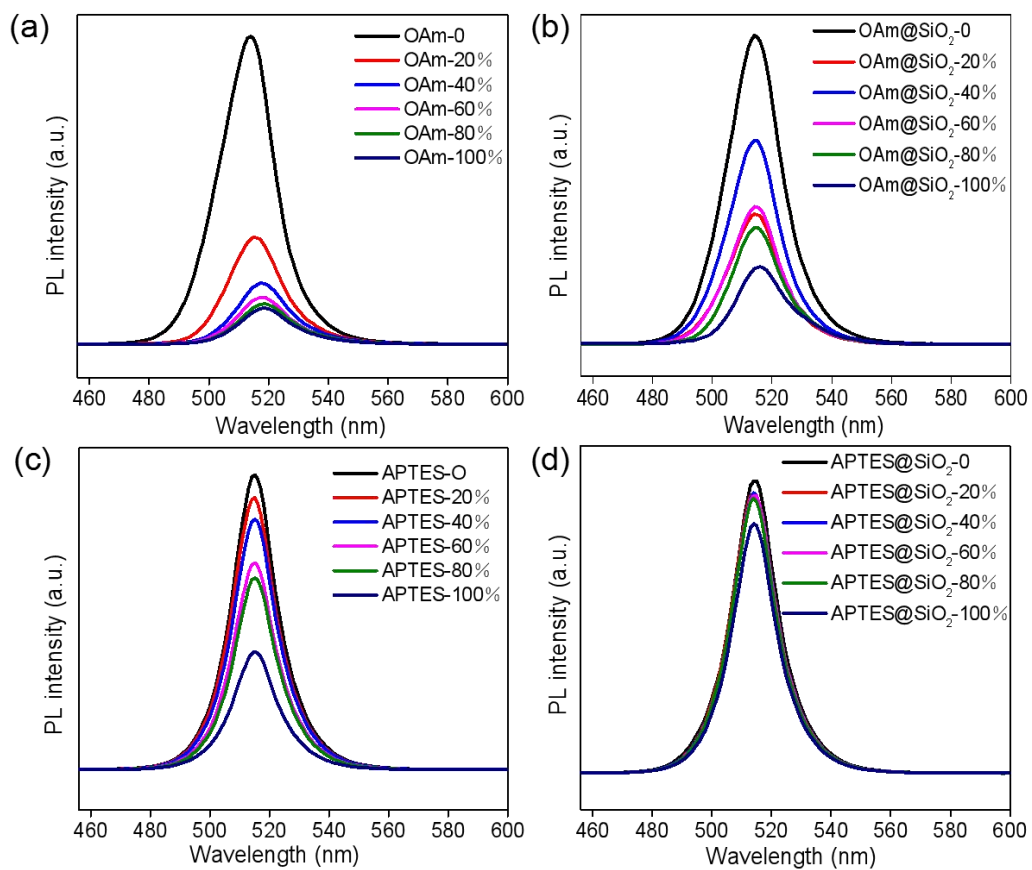


Fig. S14 PL curves of the (a) OAm-QDs, (b) OAm@SiO₂ (c) APTES-QDs, and (d) APTES-QDs@SiO₂ treated with ethanol of varying volume ratios.

Table S1 The average lifetimes of OAm-QDs, APTES-QDs, and APTES-QDs@SiO₂. The time-resolved PL decay curve were fitted by the biexponential decay function of $A(t) = A_1 \exp\left(-\frac{t}{\tau_1}\right) + A_2 \exp\left(-\frac{t}{\tau_2}\right)$, and the average lifetime were calculated using

$$\tau_{ave} = \frac{A_1 \tau_1^2 + A_2 \tau_2^2}{A_1 \tau_1 + A_2 \tau_2} \cdot 1$$

Sample code	A ₁	τ ₁ (ns)	A ₂	τ ₂ (ns)	τ _{ave} (ns)
OAm-QDs	0.73	6.6	0.22	2.28	6.19
APTES-QDs	0.43	22.14	0.48	3.72	19.23
APTES-QDs@SiO ₂	0.44	27.62	0.48	5.06	23.86

References

- 1 B. Huang, H. Yang, L. Zhang, Y. Yuan, Y. Cui and J. Zhang, *Nanoscale*, 2018, **10**, 18331-18340.