Electronic Supplementary Information

Ag_2ZnSnS_4-ZnS core-shell colloidal quantum dots: a near-infrared luminescent material based on environmentally-friendly elements

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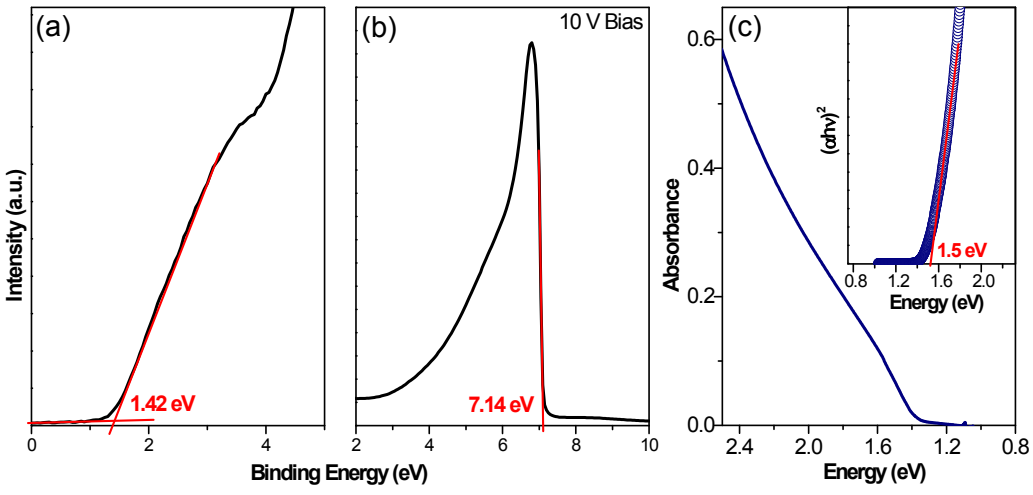

Figure S1. (a-b) UPS scans (under excitation by HeI 21.2 eV photons) of AZTS QDs. (c) The absorption spectra of the QDs and the inset shows the band gap determined from absorption Tauc plot.

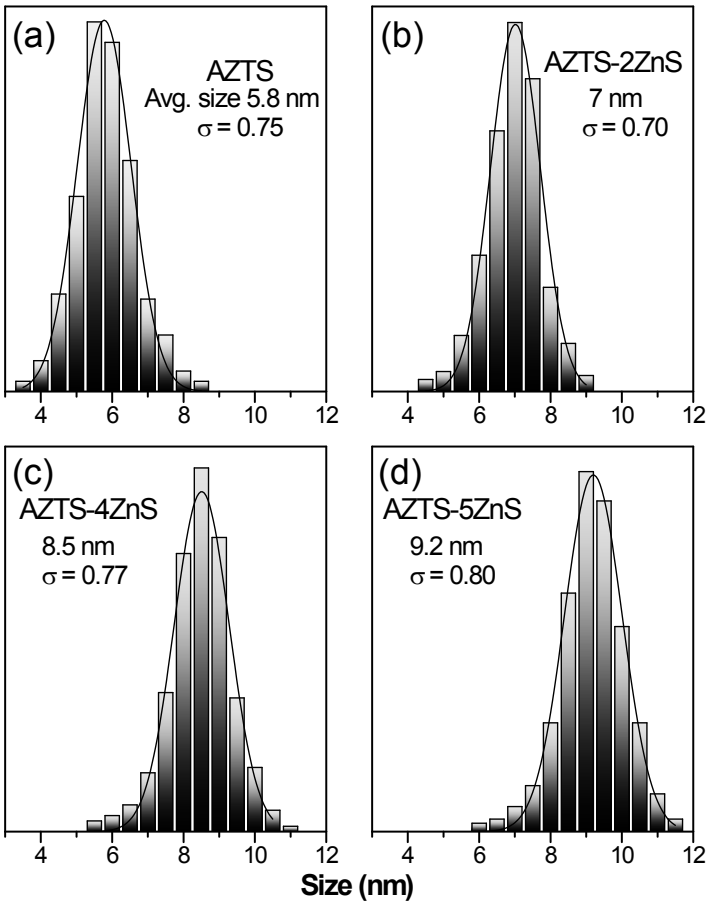

Figure S2. Size distribution of (a) AZTS core and (b-d) various AZTS-ZnS core shell QDs with different shell thickness.

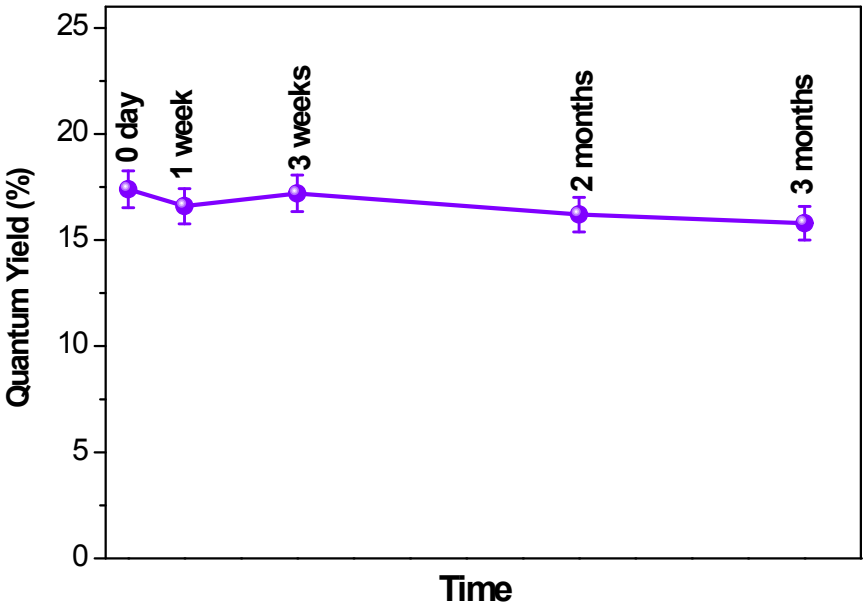

Figure S3. PLQY of the AZTS-ZnS QDs with time. QDs were stored in ambient condition in solution.

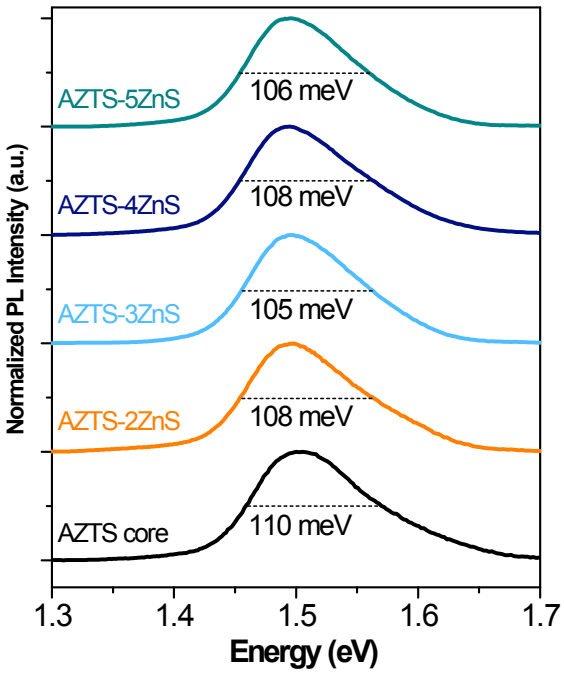

Figure S4. Normalized PL spectra for AZTS core and AZTS-ZnS core shell QDs with different shell thicknesses.

Table T1: Lifetime decay components obtained after fitting the decay curves of different QDs. The PL decay fitting was carried out with a bi-exponential function $y= y_0+A_1\exp(-t/\tau_1) + A_2\exp(-t/\tau_2)$. The average lifetime was calculated using the equation: $\langle\tau\rangle= (A_1\tau_1+A_2\tau_2)/(A_1+A_2)$.

	A_1	τ_1 (ns)	A_2	τ_2 (ns)	$\langle\tau\rangle$ (ns)
AZTS	0.95	0.64	0.05	8.2	1.0
AZTS-1ZnS	0.94	1.09	0.06	19.5	2.1
AZTS-2ZnS	0.70	10.5	0.30	58.7	24.9
AZTS-3ZnS	0.64	12.2	0.36	64.1	30.9
AZTS-4ZnS	0.59	26.1	0.41	102.6	57.5
AZTS-5ZnS	0.53	9.6	0.47	67.5	36.8

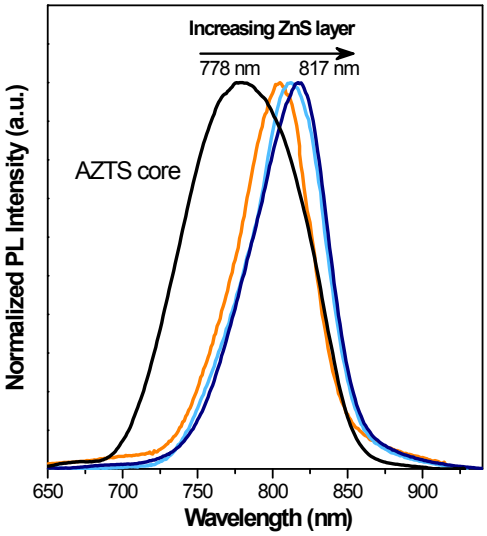

Figure S5. Evolution of Photoluminescence spectra (normalized) starting from a smaller core having size 5.3 nm.

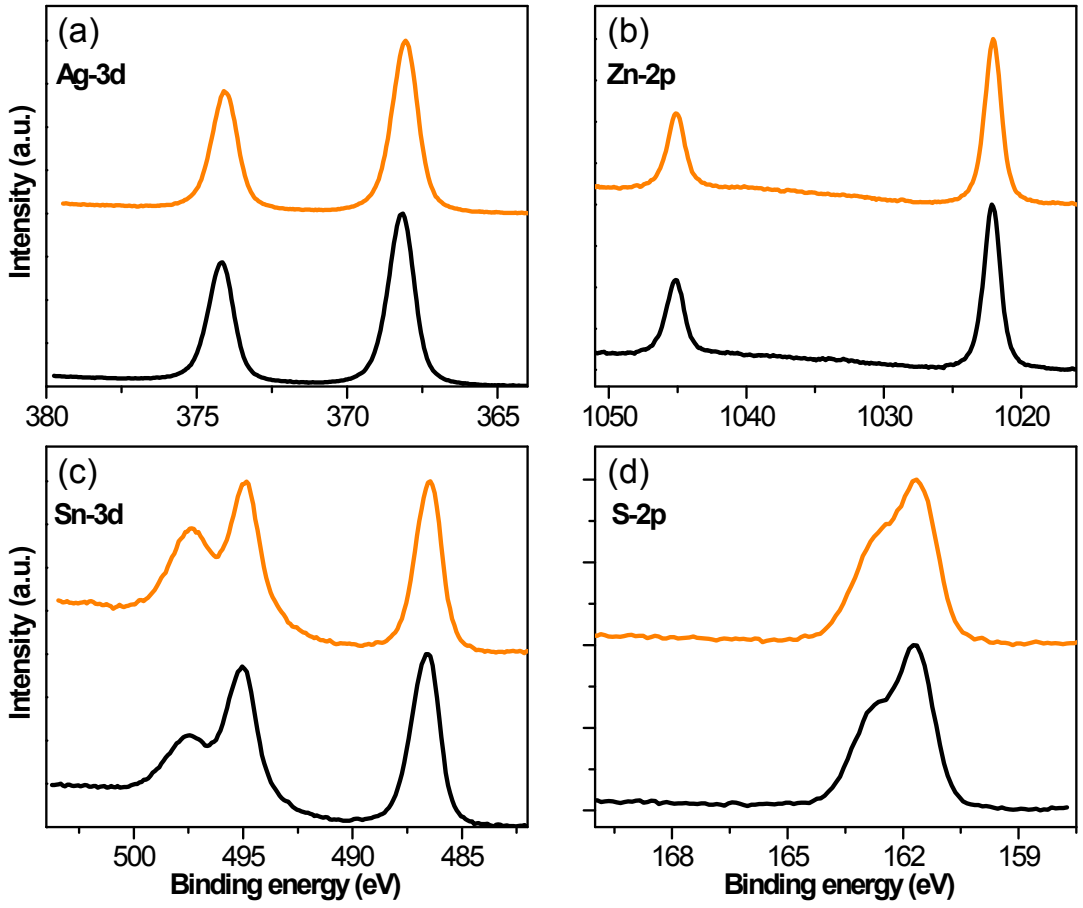

Figure S6. High resolution x-ray photoelectron spectra of AZTS core and AZTS-4ZnS core-shell QDs demonstrating (a) Ag 3d, (b) Zn 2p (c) Sn 3d and (d) S 2p peaks.

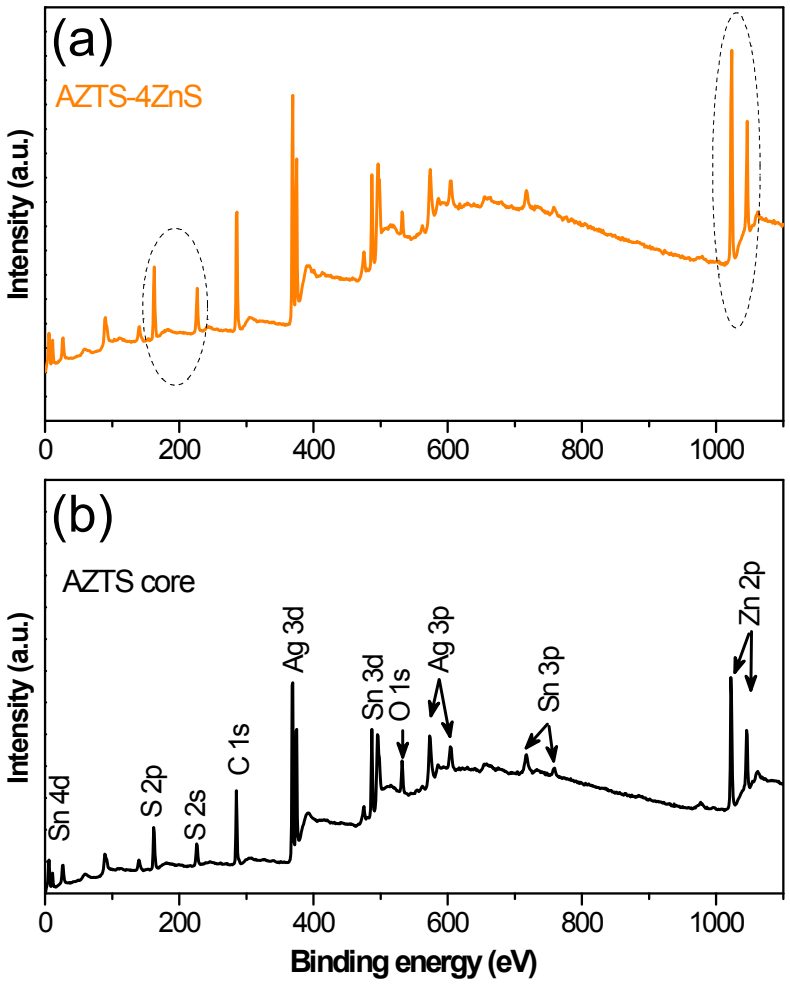

Figure S7. A comparison of the complete XPS spectrum of (a) AZTS-4ZnS core shell and (b) AZTS core QDs. Dotted line shows the change in the intensity of the Sulfur 2s, 2p and Zn 2p peaks.