

## Supporting Information

### Size-controllable fabrication of PbS quantum dots for NIR-SWIR photodetector with extended wavelength

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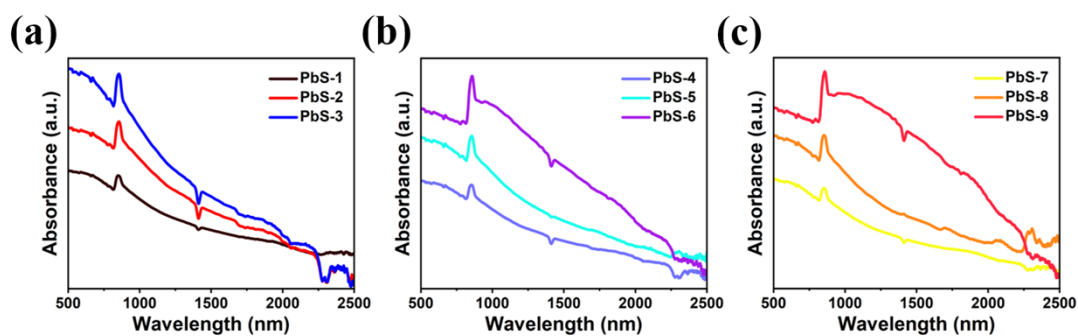
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#### 1. Effects of reaction time and temperature

**Table S1** Wavelength of exciton absorption peak and particle size corresponding to growth time.

Samples	Temperature (°C)	Growth time (s)	$\lambda_{1s}$ (nm)
PbS-1		30	-
PbS-2	190	60	-
PbS-3		90	-
PbS-4		30	-
PbS-5	195	60	-
PbS-6		90	-
PbS-7		30	-
PbS-8	200	60	-
PbS-9		90	-

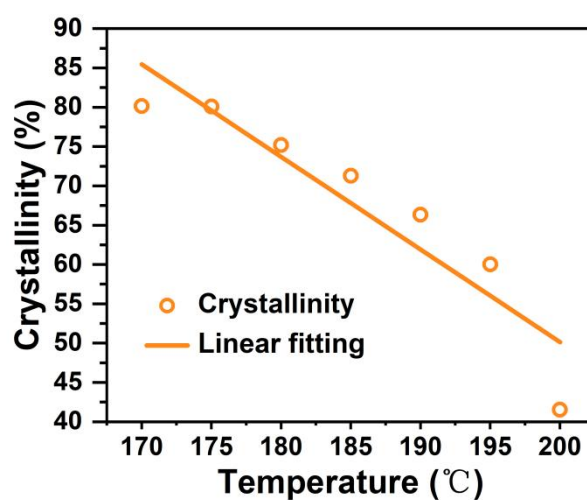


**Fig. S1** (a) Absorption spectra of PbS QDs obtained in different growth time at 190°C, (b) 195°C, (c) 200°C.

## 2. Crystallinity

**Table S2** The effect of temperature on crystallinity of PbS QDs.

Samples	Temperature (°C)	Crystallinity (%)
1	170	80.15
2	175	80.09
3	180	75.19
4	185	71.27
5	190	66.32
6	195	60.01
7	200	41.54

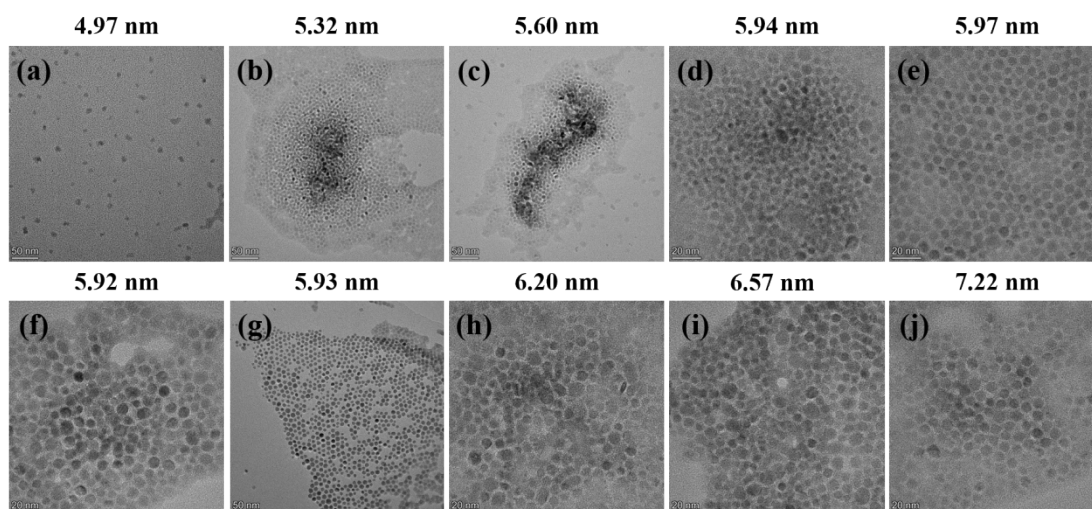


**Fig. S2** The influence of temperature on crystallinity of PbS QDs.

### 3. Effects of OA:Pb ratio

**Table S3** Wavelength of exciton absorption peaks and particle sizes of the PbS QDs synthesised at different conditions (samples are named by temperature and OA:Pb ratio).

Samples	OA:Pb	$\lambda_{1s}$ (nm)	Average particle size (nm)
150-10	10	~1280	4.97
150-12	12	~1374	5.32
150-14	14	~1436	5.60
150-16	16	~1536	5.94
150-17	17	~1542	5.97
150-18	18	~1528	5.92
150-20	20	~1532	5.93
155-17	17	~1624	6.20
160-17	17	~1662	6.57
165-17	17	~1692	7.22
170-17	17	~1732	7.50



**Fig. S3** TEM images of PbS QDs synthesized at different conditons: (a) 150°C, OA:Pb = 10, (b) 150 °C, OA:Pb = 12, (c) 150 °C, OA:Pb = 14, (d) 150 °C, OA:Pb = 16, (e) 150 °C, OA:Pb = 17, (f) 150 °C, OA:Pb = 18, (g) 150 °C, OA:Pb = 20, (h) 155 °C, OA:Pb = 17, (i) 160 °C, OA:Pb = 17, (j) 165 °C, OA:Pb = 17.

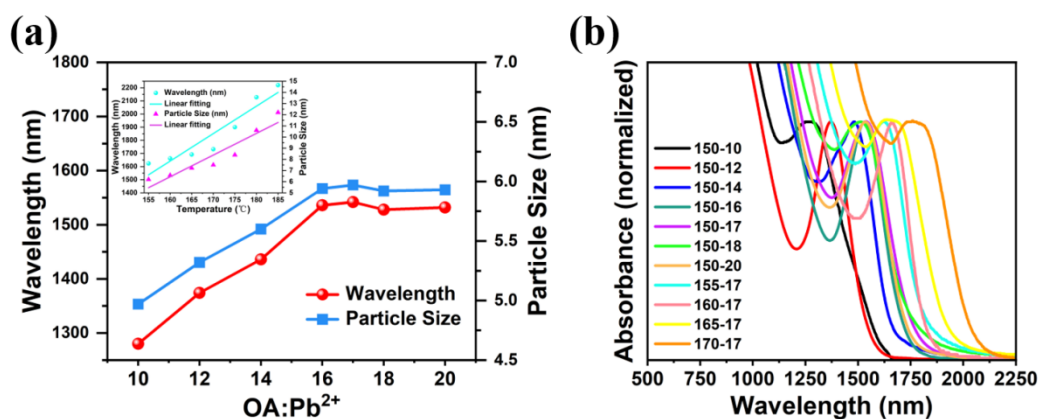


Fig. S4 (a) Influence of OA:Pb ratio on exciton absorption peak and particle size (The inset shows the influence of temperature on exciton absorption peak and particle size), (b) absorption spectra of PbS QDs synthesized at different OA:Pb ratios and temperatures.

#### 4. Ligand structure

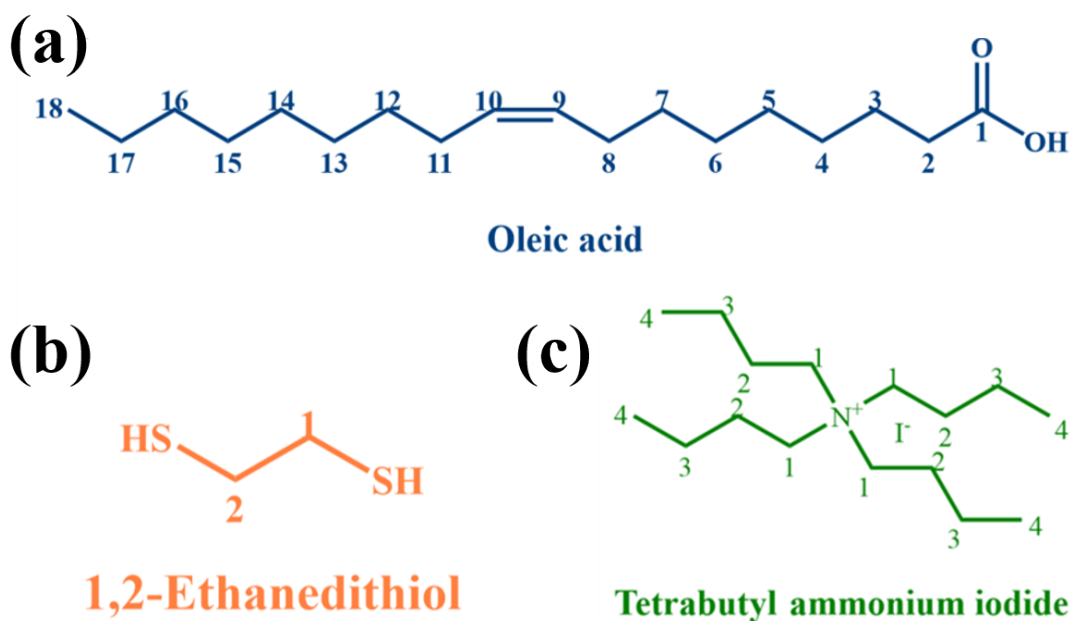
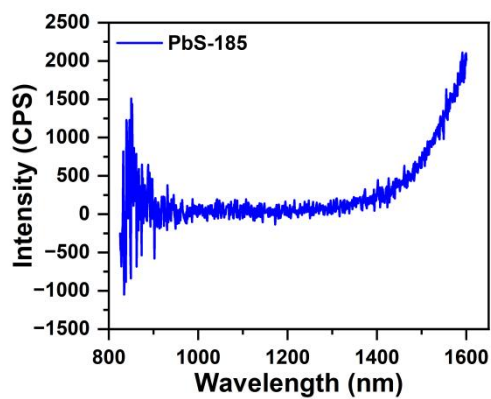


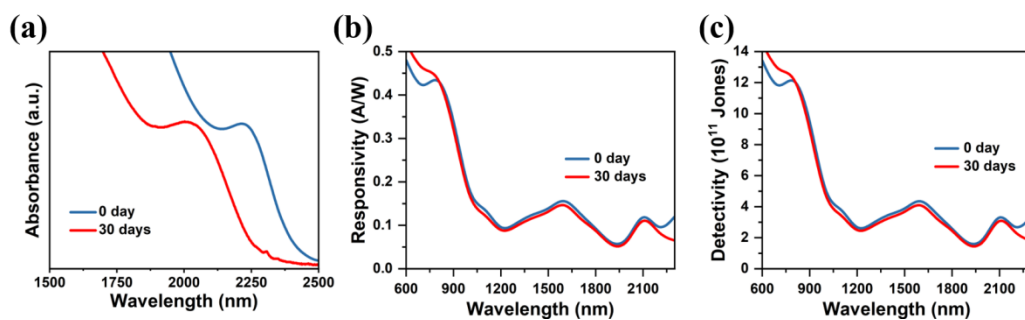
Fig. S5 (a) Structure of oleic acid, (b) 1,2-Ethanedithiol (EDT) and (c) tetrabutyl ammonium iodide (TBAI).

## 5. PL emission spectrum



**Fig. S6** PL emission spectra of PbS QDs synthesized at 185°C, OA:Pb ratio = 17.

## 6. Long-term operational stability



**Fig. S7** Absorption spectral changes of PbS QDs after being exposed to air for one month (a), Changes in responsivity (b) and detectivity (c) of the photodetector based on PbS QDs after one month of operation.