## Supporting information:

## Manipulating the Growth of Aqueous Semiconductor Nanocrystals through

## **Amine-Promoted Kinetic Process**

Jishu Han, Hao Zhang<sup>\*</sup>, Haizhu Sun, Ding Zhou and Bai Yang

State Key Laboratory of Supramolecular Structure and Materials, College of Chemistry,

Jilin University, Changchun 130012, P. R. China

*E-mail: hao\_zhang@jlu.edu.cn* 

**Figure S1.** Temporal size evolution of MPA-stabilized CdTe NCs at  $100^{\circ}$ C simultaneously in the presence of NH<sub>3</sub> (upper panel) and N<sub>2</sub>H<sub>4</sub> (lower panel). The diameter of NCs was derived from the 1s-1s electronic transition in the absorption spectra. Corresponding UV-vis absorption spectra and PL spectra were indicated in Figure 1b and d.



Figure S2. XPS Cd 3d, Te 3d, S 2p, and N 1s spectra of CdTe NCs prepared by refluxing the precursors at 100°C for 30 min in the presence of 0.875 mol/L N<sub>2</sub>H<sub>4</sub>.



**Table S1.** The calculated Cd/Te/S/N molar ratio of NCs prepared by refluxing the precursors at 100°C in the absence and in the presence of 0.875mol/L N<sub>2</sub>H<sub>4</sub>, which was determined by XPS measurement. It confirmed that N<sub>2</sub>H<sub>4</sub> could coordinate with NCs, thus decreasing the amount of adsorbed MPA.

	Cd	Te	S	Ν
N <sub>2</sub> H <sub>4</sub> -free	1	0.324	2.195	0
0.875mol/L N <sub>2</sub> H <sub>4</sub>	1	0.094	1.679	0.448

**Table S2.** Comparison of the XRD (111) peak of MPA-stabilized CdTe NCs. NCs were respectively prepared by the storage of precursors at room temperature in the presence of 12mol/L  $N_2H_4$ , and by conventional reflux at 100°C in the absence of  $N_2H_4$ . The (111) peak position of bulk CdTe and CdS crystal was 24.03 and 26.53, respectively.

XRD (111) peak of CdTe NCs				
Emission peak position (nm)	Hydrazine-promoted growth (degree)	Reflux-promoted growth (degree)		
525	24.24	24.27		
566	24.14	24.36		
597	24.14	24.54		
630	24.14	25.11		

**Table S3.** The average size and size distribution of CdTe NCs with different emission colors that prepared by  $N_2H_4$ -promoted growth at room temperature, which was calculated by TEM measurement. Corresponding TEM images were indicated in Figure 3.

Emission peak position (nm)	Average size (nm)	Size distribution
525	3.5	(%) 31.5
<u> </u>	<u>3.8</u> 4.5	32.1 21.9
630	5.0	26.2

**Table S4.** Comparison of the zeta potential of MPA-stabilized CdTe NCs in the absence and in the presence of  $N_2H_4$ . NCs were prepared by the storage of precursors at room temperature for 3 hours. One could see from the zeta potential measurement that the addition of  $N_2H_4$  significantly decreased the electrostatic repulsion between NCs and Cd monomers.

	zeta potential (mV)		
N <sub>2</sub> H <sub>4</sub> -free	-50		
6mol/L N <sub>2</sub> H <sub>4</sub>	-26		
12mol/L N <sub>2</sub> H <sub>4</sub>	-2.7		

**Table S5.** Stepwise formation constants for Cd<sup>2+</sup> with MPA, NH<sub>3</sub>, and N<sub>2</sub>H<sub>4</sub>. Values were taken from *Mar. Chem.*, 2000, **70**, 181-189 and *J. Chem. Soc. Dalton Trans.*, 1979, 731-734.

	log K
$Cd^{2+}+MPA^{2-}\rightarrow Cd(MPA)$	8.8
$Cd(MPA)+MPA^{2}\rightarrow Cd(MPA)_{2}^{2}$	4.8
$Cd^{2+}+NH_3 \rightarrow Cd(NH_3)^{2+}$	2.65
$Cd^{2+}+N_2H_4 \rightarrow Cd(N_2H_4)^{2+}$	2.25

**Figure S3.** Temporal evolution of the UV-vis peak of MPA-stabilized CdTe NCs at room temperature in the presence of  $12 \text{mol/L N}_2\text{H}_4$ . The molar ratio of Cd/MPA/Te was fixed at 1:2.4:0.2, whereas the concentration of Cd<sup>2+</sup> was varied from 0.5 to 5mmol/L.



Figure S4. Temporal evolution of the UV-vis peak of TG-stabilized CdTe NCs at room temperature in the presence of 12mol/L  $N_2H_4$ . The molar ratio of Cd/TG/Te was fixed at 1:2.4:0.2, whereas the concentration of Cd<sup>2+</sup> was 0.5mmol/L.



**Figure S5.** Comparison of the UV-vis absorption spectra of MPA-stabilized ZnS, CdS,  $Zn_xCd_{1-x}S$ , and  $CdSe_yTe_{1-y}$  NCs prepared by storing the precursors at room temperature in the absence, and in the presence of 12.5mol/L NH<sub>3</sub> or N<sub>2</sub>H<sub>4</sub>. The storage duration was 48 hours for ZnS, and 40 hours for CdS,  $Zn_xCd_{1-x}S$ , and CdSe<sub>y</sub>Te<sub>1-y</sub>. The molar ratio of metal/MPA/chalcogenide was fixed at 1:2.4:0.2, whereas the concentration of Cd<sup>2+</sup> was 0.5mmol/L. For Zn<sub>x</sub>Cd<sub>1-x</sub>S and CdSe<sub>y</sub>Te<sub>1-y</sub>, the molar ratio of Zn/Cd and Se/Te was 1:1.

