

Supporting Information

Effective doping atomization synthesis of ferromagnetic CdS:Y nanocrystals

Pan Wang, Rui Zhao, Zhifang li, Tianye Yang and Mingzhe Zhang*

State Key Laboratory of Superhard Materials, Jilin University, Changchun 130012,
China

1. The growth mechanism of CdS:Y nanocrystals

Figure S1 presents the experimental setup of CdS:Y nanocrystals via an effective doping atomization method. The reaction solution is atomized to form the fog droplets with the average diameter of 1 μm . The amount of Cd^{2+} cations in 100 ml reaction solution is 12.04×10^{17} (The $\text{Cd}(\text{COOCH}_3)_2$ solution concentration is 10 mmol/L, and the amount of $\text{Cd}(\text{COOCH}_3)_2$ solution is 20 ml in the 100 ml reaction solution). The the average volume of fog droplets is 0.52×10^{-18} cube meters. The average amount of Cd^{2+} cations in one fog droplet is 6.28×10^3 . The volume of primitive cell of wurtzite CdS structure (lattice parameters, $a = 4.14 \text{ \AA}$, $c = 6.72 \text{ \AA}$) which contains two Cd^{2+} cations is 99.79×10^{-30} cube meters. Therefore, in the case of every Cd^{2+} cation involving in the reaction, the the amount of Cd^{2+} cations in one fog droplet can form about 8.4 nm sized wurtzite CdS nanoparticles.

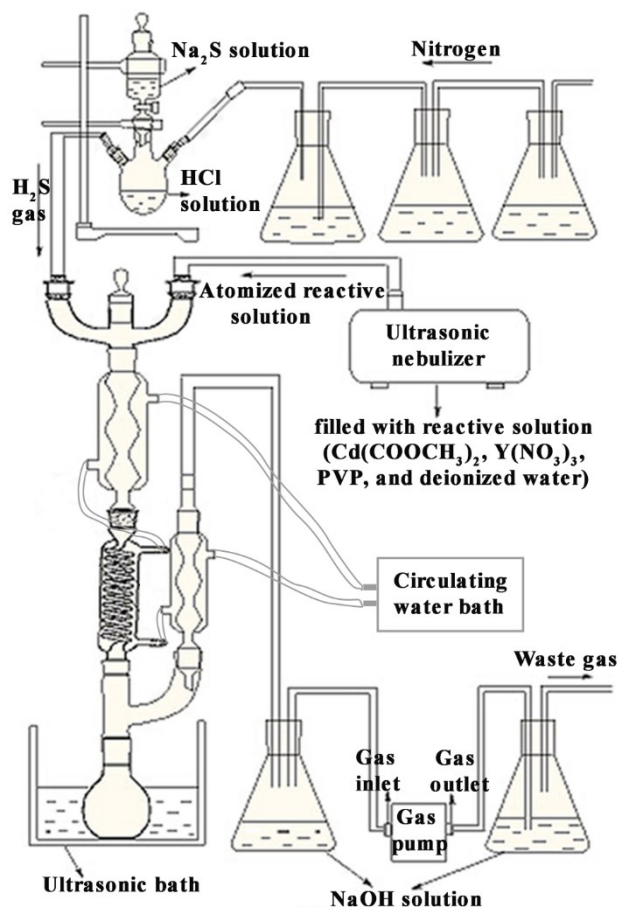


Figure S1. Experimental setup of CdS:Y nanocrystals via an effective doping atomization method.

2. Energy-dispersive X-ray spectroscopy (EDS) Characterization

As we can see from Table S1-S5 of EDS analysis, Y concentrations of the synthesized CdS:Y nanocrystals are 0.05 atom%, 0.11 atom%, 0.18 atom%, 0.33 atom%, and 0.57 atom% for the 0.06, 0.10, 0.12, 0.14, and 0.16 of the molar ratio of Y^{3+} and Cd^{2+} in the reaction solution, respectively.

Table S1. Element content percentage of the wurtzite CdS:Y nanocrystals for the 0.06 molar ratio of Y^{3+} and Cd^{2+} in the reaction solution.

Element	Weight (%)	Atom (%)
S	24.82	53.64
Y	0.07	0.05

Cd	75.11	46.31
Total	100.00	100.00

Table S2. Element content percentage of the wurtzite CdS:Y nanocrystals for the 0.10 molar ratio of Y³⁺ and Cd²⁺ in the reaction solution.

Element	Weight (%)	Atom (%)
S	25.12	54.03
Y	0.14	0.11
Cd	74.73	45.85
Total	100.00	100.00

Table S3. Element content percentage of the wurtzite CdS:Y nanocrystals for the 0.12 molar ratio of Y³⁺ and Cd²⁺ in the reaction solution.

Element	Weight (%)	Atom (%)
S	22.49	50.41
Y	0.22	0.18
Cd	77.29	49.41
Total	100.00	100.00

Table S4. Element content percentage of the wurtzite CdS:Y nanocrystals for the 0.14 molar ratio of Y³⁺ and Cd²⁺ in the reaction solution.

Element	Weight (%)	Atom (%)
S	22.45	50.33
Y	0.41	0.33
Cd	77.15	49.34
Total	100.00	100.00

Table S5. Element content percentage of the wurtzite CdS:Y nanocrystals for the 0.16 molar ratio of Y³⁺ and Cd²⁺ in the reaction solution.

Element	Weight (%)	Atom (%)
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S	23.82	52.23
Y	0.72	0.57
Cd	75.46	47.20
Total	100.00	100.00
