Electronic Supplementary Material (ESI) for ChemComm.

Shape Control of Zincblende CdSe Nanoplatelets – Electronic Supporting Information

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1. Experimental section

Chemicals

$Cd(NO_3)_2.4H_2O$, $Cd(OAc)_2$, $Cd(OAc)_2.2H_2O$, sodium myristate, propionic acid, formic acid, methanol, hexane, octadecene (ODE) and oleic acid (OA) were purchased from sigma-aldrich. CdO and metallic selenium powder were purchased from Strem chemicals. $Cd(OAc)_2$ and Se were stored in a glovebox.

Precursor synthesis

Cadmium myristate, $Cd(Myr)_2$ synthesis

In a 1000-mL round bottom flask 5 g of sodium myristate (20 mmol) was dissolved in 250 mL of methanol using sonication and vigorous stirring. In a second 500 mL round bottom flask 3 g of $Cd(NO_3)_2.4H_2O$ (10 mmol) was dissolved in methanol. The latter cadmium solution was then added dropwise to the first, and subsequently stirred for 2 h at room temperature. A white precipitate formed, which was filtered and washed with 20 mL of methanol three times. The remaining white solid was vacuum dried at 40 °C overnight affording 4.5g of $Cd(Myr)_2$ (7.9 mmol, 79% reaction yield). The $Cd(Myr)_2$ water content was measured with thermo-gravimetric analysis (TGA), and it was stored in the dark at 4°C.

Cadmium formate, $Cd(OOCH)_2$ synthesis

In a 100 mL round bottom flask, 2 g of CdO (15.6 mmol) was dissolved in 20 mL of de-ionized and distilled water. Next, 1.19 mL of formic acid (31.2 mmol) was added dropwise. The solution was stirred overnight. A white precipitate formed and was filtered and washed three times with 5 mL of water. The remaining solid was vacuum dried at 40°C overnight to afford 214 mg of $Cd(OOCH)_2$, (1.1 mmol, 7% yield). The $Cd(OOCH)_2$ water content was measured with TGA and it was stored in the dark at 4°C.

Cadmium proprionate, $Cd(OPr)_2$ synthesis

In a 100 mL round bottom flask 2.08 g of CdO (16 mmol) was dissolved in 15 mL of propionic acid. The solution was stirred for 2 hours at 70°C. The resulting white precipitate was centrifuged (2500 rpm, 10 min), redispersed in 5 mL of ethanol and centrifuged again. The remaining white powder was vacuum dried overnight at 40°C to afford 3.22 g (12.5 mmol, 78% yield). The $Cd(OOCCH_2CH_3)_2$ water content was measured with TGA and it was stored in the dark at 4°C.

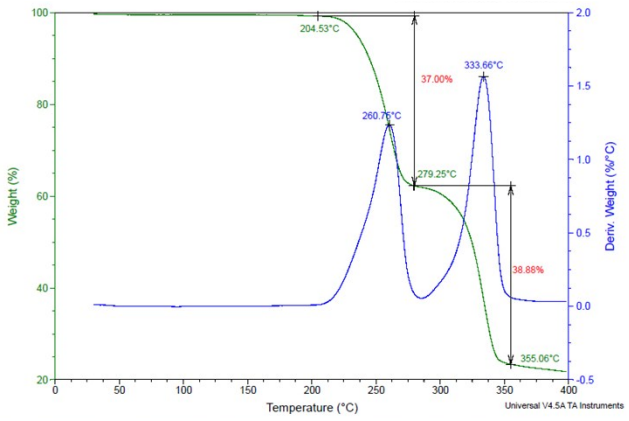
Cadmium hydroxide $Cd(OH)_2$ synthesis.

In a 25 mL round bottom flask, 1 g of $Cd(NO_3)_2$. $4H_2O$ (3.2 mmol) was dissolved in 10 mL of de-ionized water. 5 mL of a saturated NaOH solution in de-ionized water was added and a white precipitate formed. The mixture was stirred for 45 min and subsequently centrifuged. The white solid was washed three times with 5 mL of de-ionized water. The resulting powder was vacuum dried 40 °C overnight affording 153 mg of $Cd(OH)_2$ (1.0 mmol, 33% yield). The $Cd(OH)_2$ water content was measured with TGA and it was stored in the dark at 4°C.

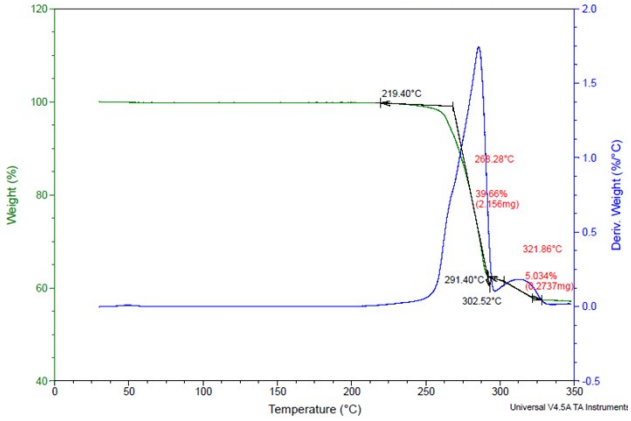
2. Thermo-gravitational analysis of precursors

2 to 10 mg of cadmium carboxylate or cadmium hydroxide was placed on a platinum sample holder in a TGA Q500, TA instruments apparatus. Measurements were carried out under N_2 flux with a temperature ramp of 5 °C/min from room temperature to 350 °C. Results are shown below, and indicate that cadmium myristate, formate and hydroxide are free of water (no significant weight loss is observed below 100 °C), whereas the cadmium propionate still contained traces of ethanol.

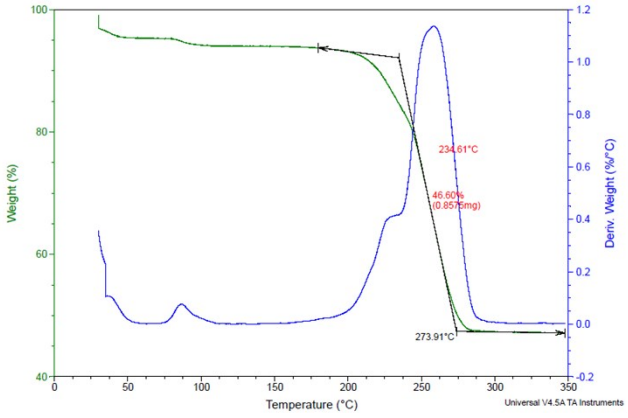
Cadmium myristate



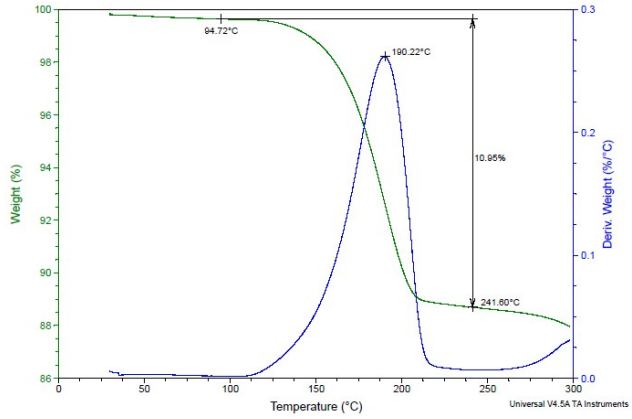
Cadmium formate



Cadmium propionate



Cadmium hydroxide

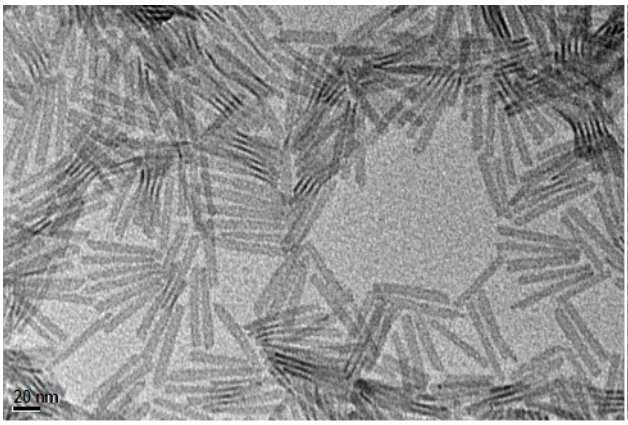


3. NPL control syntheses

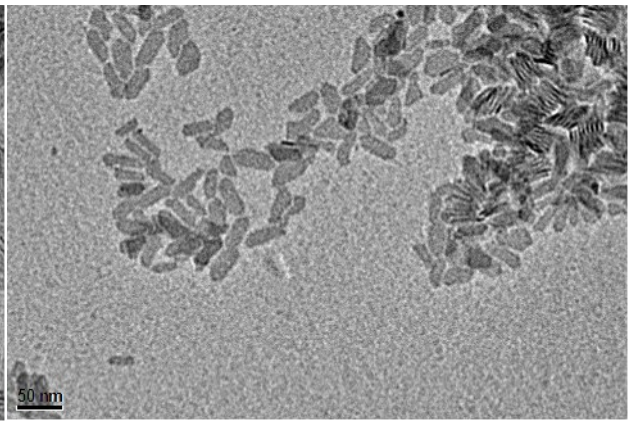
Table S1: Influence of the $Cd(OAc)_2$ degree of hydration

Name	$Cd(OAc)_2$ (mol %)	$Cd(OAc)_2.2H_2O$ (mol %)	Length (nm)	Width (nm)	Ratio
NPL-dry	100	0	48.66	6.75	7.49
NPL-wet	0	100	34.2	14.9	2.30

NPL-dry



NPL-wet

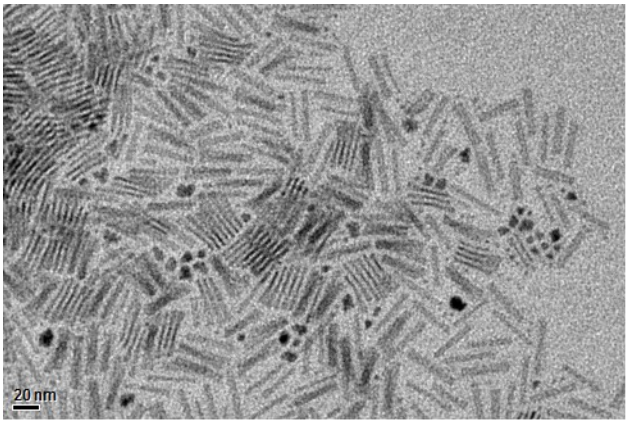


The synthesis using $Cd(OAc)_2.2H_2O$ clearly yields NPLs with a lower aspect ratio.

Table S2: Variation of the $Cd(OAc)_2$ concentration

Name	$Cd(OAc)_2$ (mol %)	Mass (mg)	Length (nm)	Width (nm)	Ratio
NPL-1	100	80	40.38	5.34	7.67
NPL-[Ac]<	100	40	36.66	5.41	6.96
NPL-[Ac]>	100	160	49.01	7.26	7.05

NPL-[Ac]<



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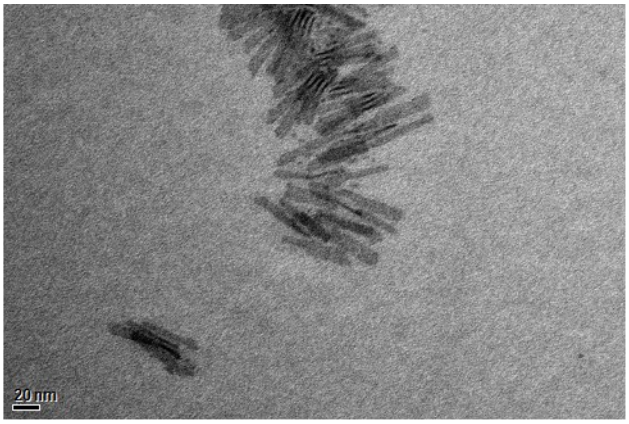
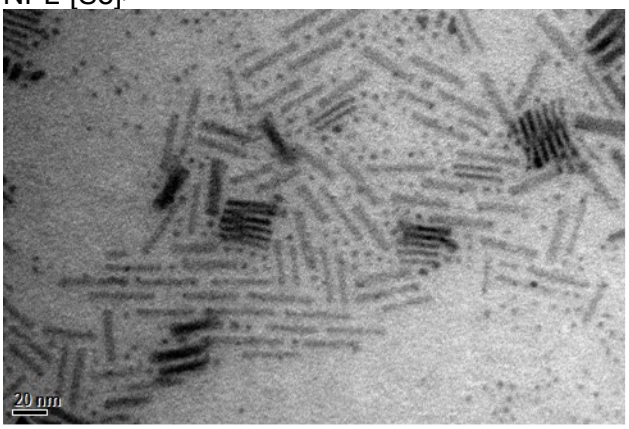


Table S3: Variation of the selenium concentration

Name	Se (mol%)	Mass (mg)	Length (nm)	Width (nm)	Ratio
NPL-1	100	24 mg	40.38	5.34	7.67
NPL-[Se]>	100	48 mg	40.68	5.05	8.22
NPL-[Se]>>	100	72 mg	32.65	4.63	7.19

NPL-[Se]>



NPL-[Se]>>

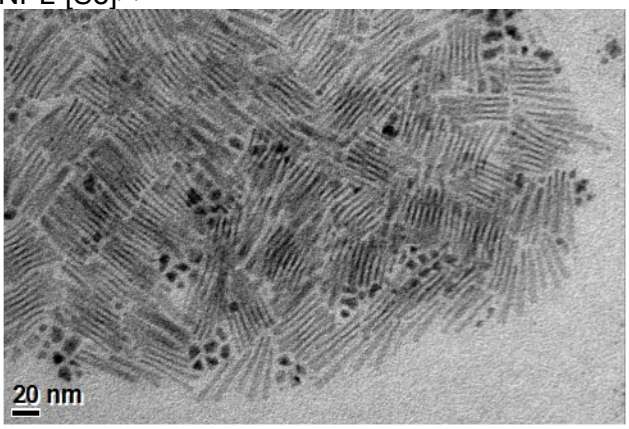
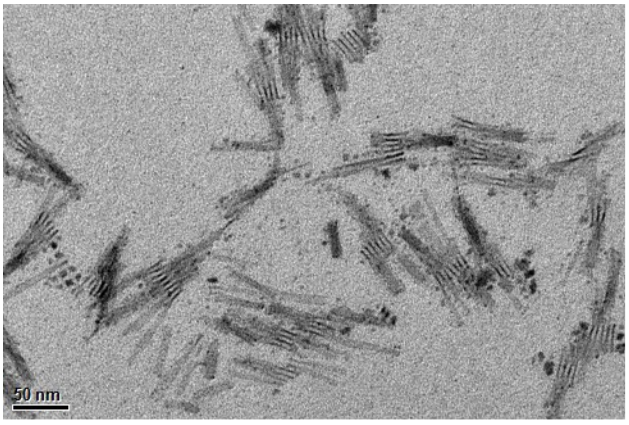


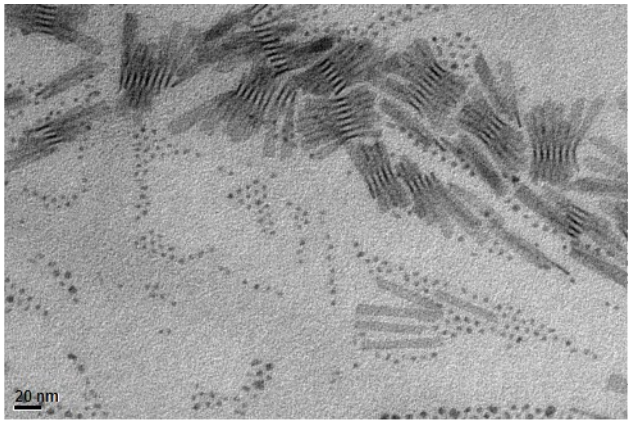
Table S4: Variation of the $Cd(Myr)_2$ concentration

Name	$Cd(Myr)_2$ (mol %)	Mass (mg)	Length (nm)	Width (nm)	Ratio
NPL -1	100	150	40.38	5.34	7.67
NPL-[Myr]<	100	50	54.80	6.60	8.59
NPL-[Myr]>	100	300	54.22	7.83	7.12

NPL-[Myr]<



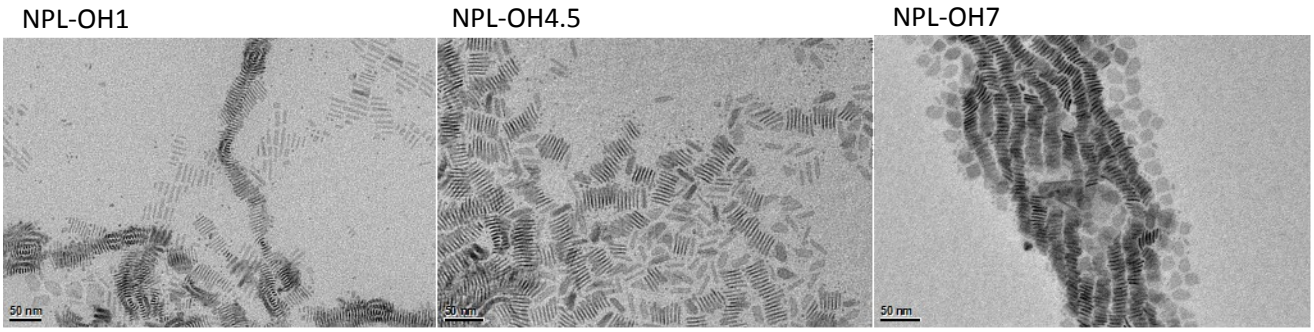
NPL-[Myr]>



Tables S2-S4: Varying the concentration of $Cd(Myr)_2$, $Cd(OAc)_2$ or Se compared to the standard reaction (NPL-1) does not significantly modify the aspect ratio.

Table S5: Synthesis with $Cd(OH)_2$

Name	$Cd(OAc)_2$ (mol %)	$Cd(OH)_2$ (mol %)	Length (nm)	Width (nm)	Ratio
NPL-1	100	0	40.38	5.34	7.67
NPL-OH1	99	1	26.83	5.30	5.20
NPL-OH4.5	95.5	4.5	25.48	7.13	3.67
NPL-OH7	93	7	19.69	15.20	1.30



When increasing the $Cd(OH)_2$ concentration, we observe a decrease of the NPL aspect ratio.

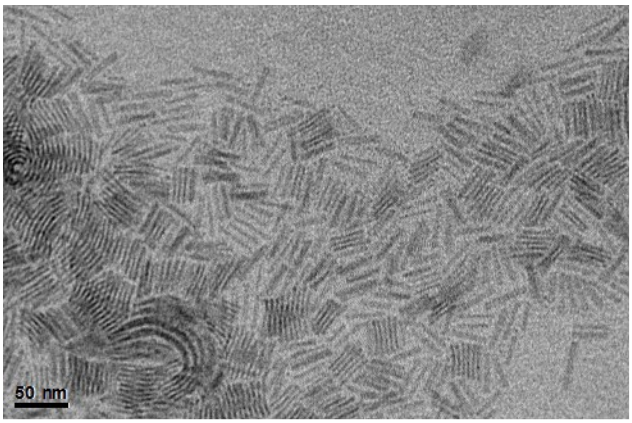
Table S6: Synthesis of NPLs using a mixture of dry/wet $Cd(OAc)_2$ with reaction time of 4 min (aliquots).

Name	$Cd(OAc)_2$ (mol %)	$Cd(OAc)_2 . 2(H_2O)$ (mol %)	Length (nm)	Width (nm)	Ratio
NPL -3a	90	10	42.95	7.15	6.18
NPL- 4a	80	20	32.22	7.50	4.35
NPL -5a	75	25	26.91	6.93	3.78
NPL- 6a	70	30	28.93	8.56	3.40
NPL -7a	60	40	13.25	6.35	2.12
NPL- 8a	50	50	16.23	11.43	1.44
NPL -9a	40	60	10.41	9.09	1.15

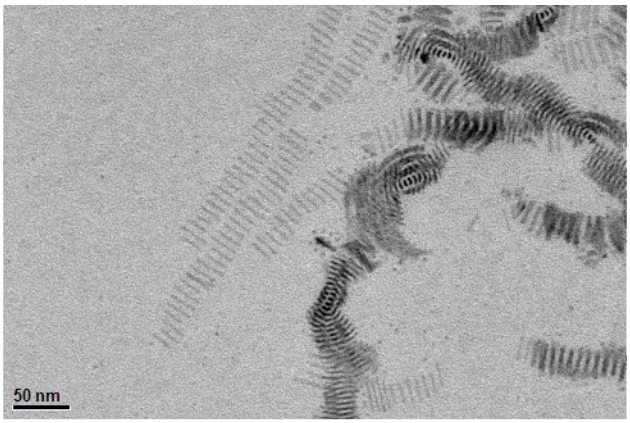
Table S7: Synthesis of NPLs using a mixture of $Cd(OPr)_2$ and $Cd(OOCH)_2$.

Name	$Cd(OPr)_2$ (mol %)	Cd(OOCH) (mol %)	Length (nm)	Width (nm)	Ratio
NPL-PF1	100	0	36.36	5.51	6.80
NPL-PF2	95	5	21.76	3.76	5.97
NPL-PF3	90	10	37.46	8.32	4.59
NPL-PF4	85	15	27.16	7.15	3.88

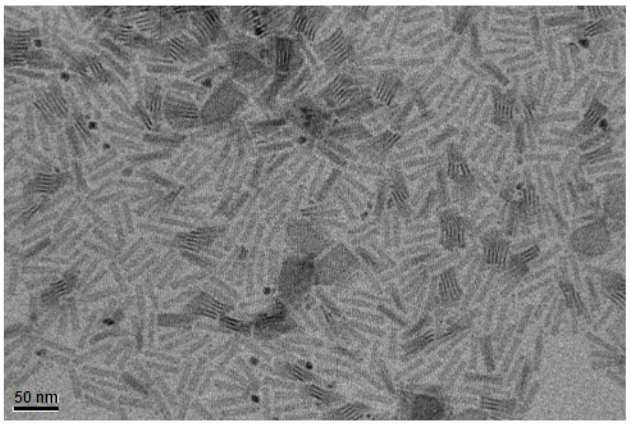
NPL-PF1



NPL-PF2



NPL-PF3



NPL-PF4

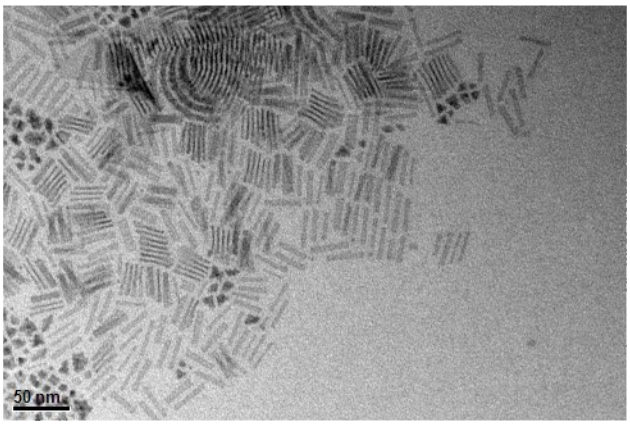
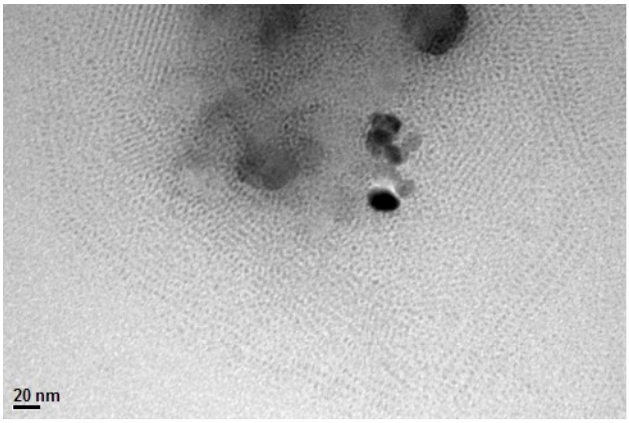


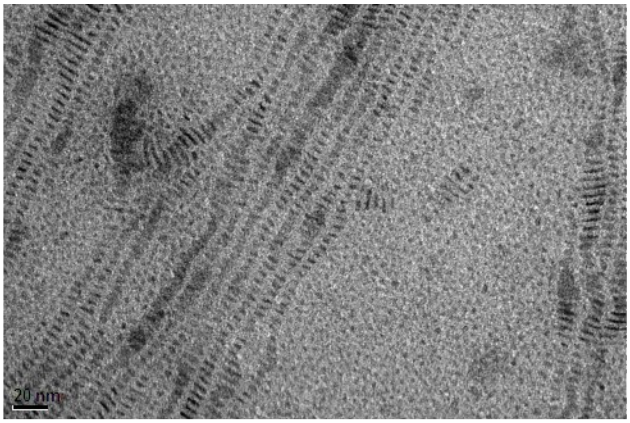
Table S8: NPLs grown for 4 minutes.

Name	$Cd(OAc)_2$ mol %	Reaction Time (sec)	Average Length (nm)	Average Width (nm)	Average Ratio
NPL-T1	100	90	9.45	2.4	4.5
NPL-T2	100	120	10.18	2.7	4.2
NPL-T3	100	150	12.11	3.4	4.5
NPL-T4	100	240	24.22	4.4	3.9

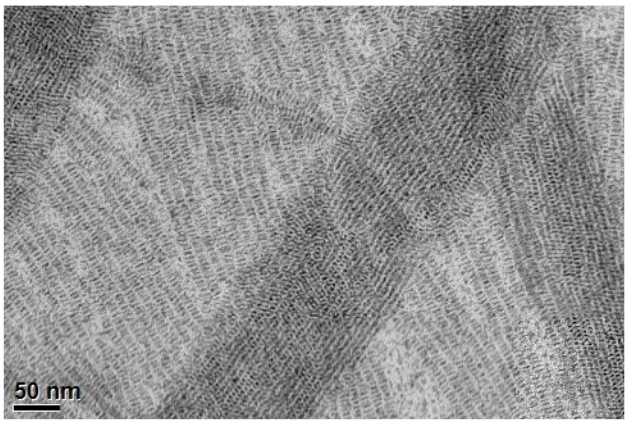
NPL-T1



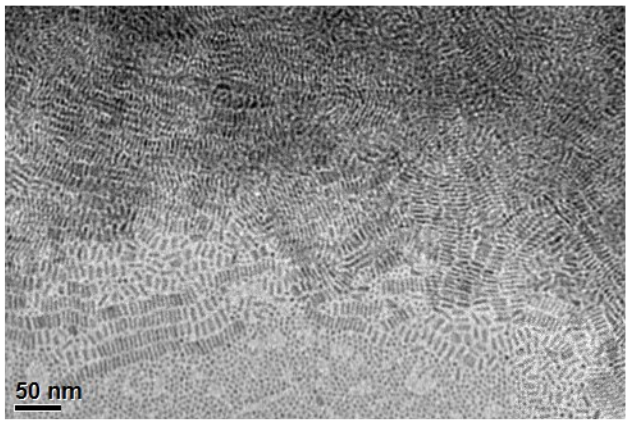
NPL-T2



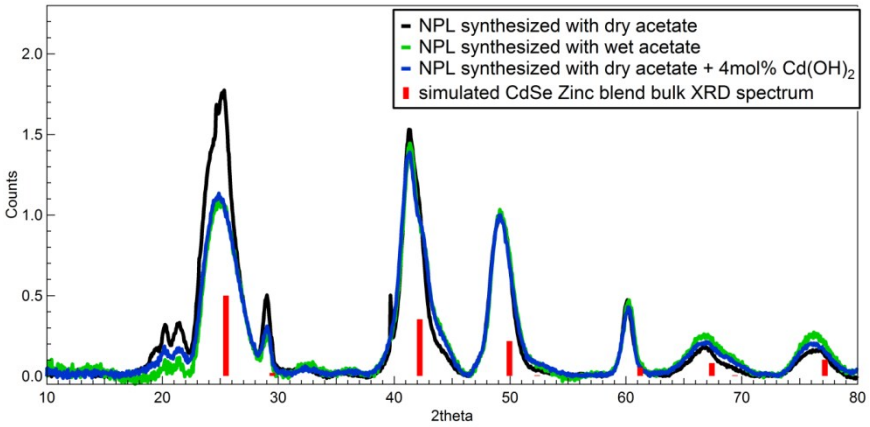
NPL-T3



NPL-T4



4. X-Ray diffraction patterns



5. Size-dependent optical properties

Table S9: Spectral position of first absorption and fluorescence peak for the different NPLs.

Name	Length (nm)	Width (nm)	Ratio	λ_{Abs}* (nm)	λ_{Em} (nm)
NPL-T1	9.45	2.4	4.5	498.1	502.4
NPL-T2	10.18	2.7	4.2	501.6	504.8
NPL-T3	12.11	3.4	4.5	503.0	506.4
NPL-T4	14.22	4.4	3.9	506.2	508.5
NPL-1	40.38	5.3	7.67	508.8	511
NPL-2	33.16	5.11	6.58	508.4	510.4
NPL-3	52.98	9.44	5.66	511.1	513.0
NPL-4	38.66	8.94	4.39	510.8	513.6
NPL-5	33.86	8.58	4.00	510.7	513.3
NPL-6	37.88	10.97	3.51	511.2	513.8
NPL-7	16.77	8.17	2.10	510.5	512.6
NPL-8	17.32	9.97	1.77	511.2	513.5
NPL-9	13.88	10.36	1.34	511.1	513.9
NPL-10	17.62	15.22	1.17	512.8	514.7

*Maximum of absorption was determined from the first peak, corresponding to the heavy hole – electron transition.