Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Electronic Supplementary Information (ESI)

Oleylamine as reducing agent in syntheses of magic-size clusters and monodisperse quantum dots: optical and photoconductivity studies

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Table S1 Peak positions (λ_p, nm/eV) and their full widths at half maximum intensity (FWHM, nm/eV) of PbSe prepared using OAM at different injection temperatures (T_{inj}, ^oC) for different waiting times (W_t, min) after injection of TOP-Se. TEM particle sizes (D_{tem}, nm) along with estimated particle sizes (D_{est}, nm) based on equation (1) are given.

T_{inj} (^oC)	W_t (min)	λ_p (nm)/(eV)		FWHM (nm)		D_{tem} (nm)	D_{est} (nm)
		Absorption	Emission	Absorption	Emission		
22	5	600/2.065	790	113	159		1.62
	1080	600/2.065	790	114	178		1.62
80	15	600/2.065	780		123		1.62
	30	600/2.065	780	111	106		1.62
	45	941/1.316	1024		152		2.83
	60	995/1.245	1078	125	149		3.02
	120	1180/1.050	1257	120	167		3.68
	180	1270/0.975	1360	120	170		4.01
100	0.5	600/2.065	780	104	125		1.62
	2	600/2.065	780	108	145		1.62
	5	600/2.065	780	109	141		1.62
	10	1046/1.184	1127	106	149		3.21
	15	1138/1.088	1215	112	155		3.53
	30	1252/0.989	1363	116	159		3.94
	60	1350/0.917	1481	114	158		4.28
120	0.5	620/1.998	800	121	144		1.69
	3	671/1.846	1111	128	158		1.87
	5	1225/1.011	1300	115	159		3.84
	10	1370/0.904	1486	108	151		4.36
	15	1411/0.878	1570	119			4.51
	30	1450/0.854		127			4.64
	60	1483/0.835		130			4.76
140	0.5	600/2.065	812	100	175	< 2	1.62
	2	1240/1.069	1308	107	142	4.1	3.61
	5	1460/0.854	1536	100	129	5.1	4.64
	10	1497/0.794	1598	101		5.4	5.03
	30	1527/0.777		119		6.3	5.15
160	0.5	1238/1.001	1304	106	145		3.89
	2	1415/0.875	1587	104			4.52
	5	1479/0.837		115			4.74
	10	1560/0.794		112			5.03
	15	1611/0.769		119			5.21
	60						
180	0.5	1676/0.739		108			5.44
	5	1782/0.695		116			5.82
	10	1962/0.631		117			6.46
	15	2118/0.585		105			7.01
	60	2394/0.517					8.01

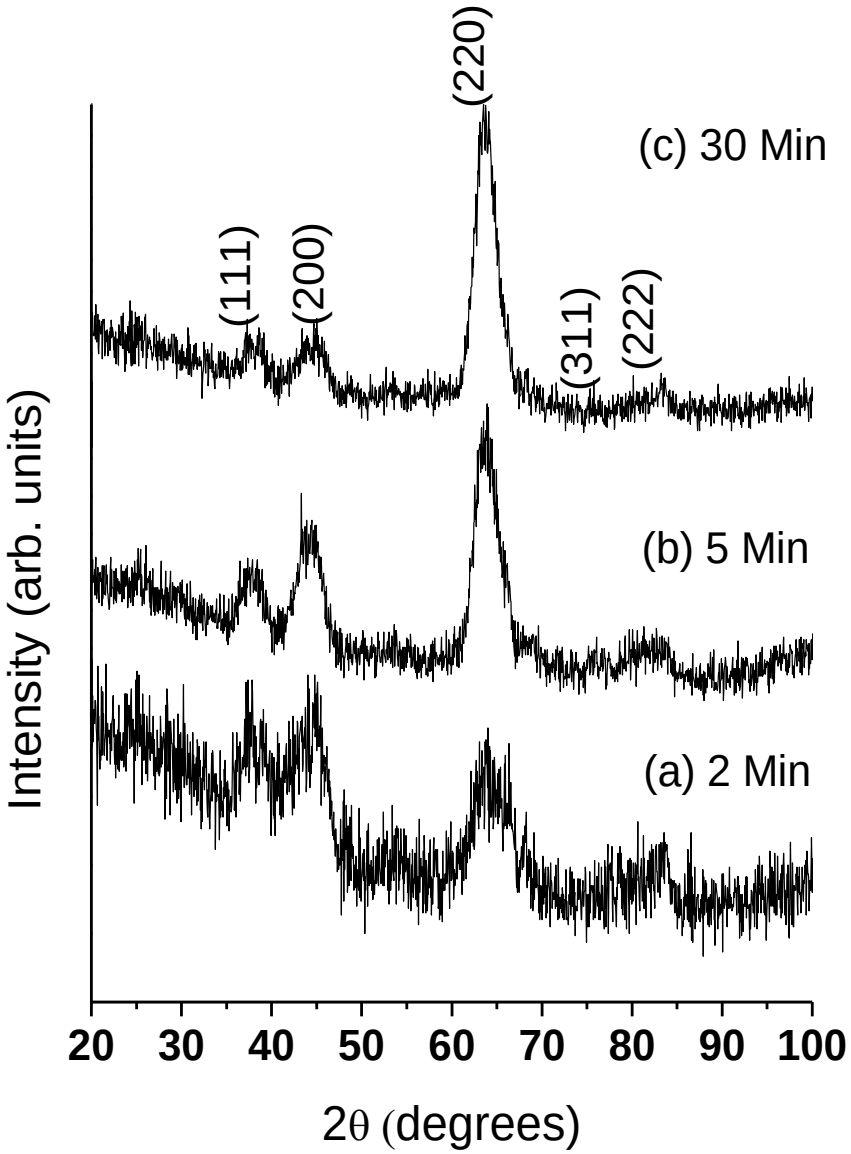

Figure S1. The XRD patterns of PbSe particles prepared using OAM at 140 ^{o}C with duration of 2, 5 and 30 min. Samples are prepared with OAM.

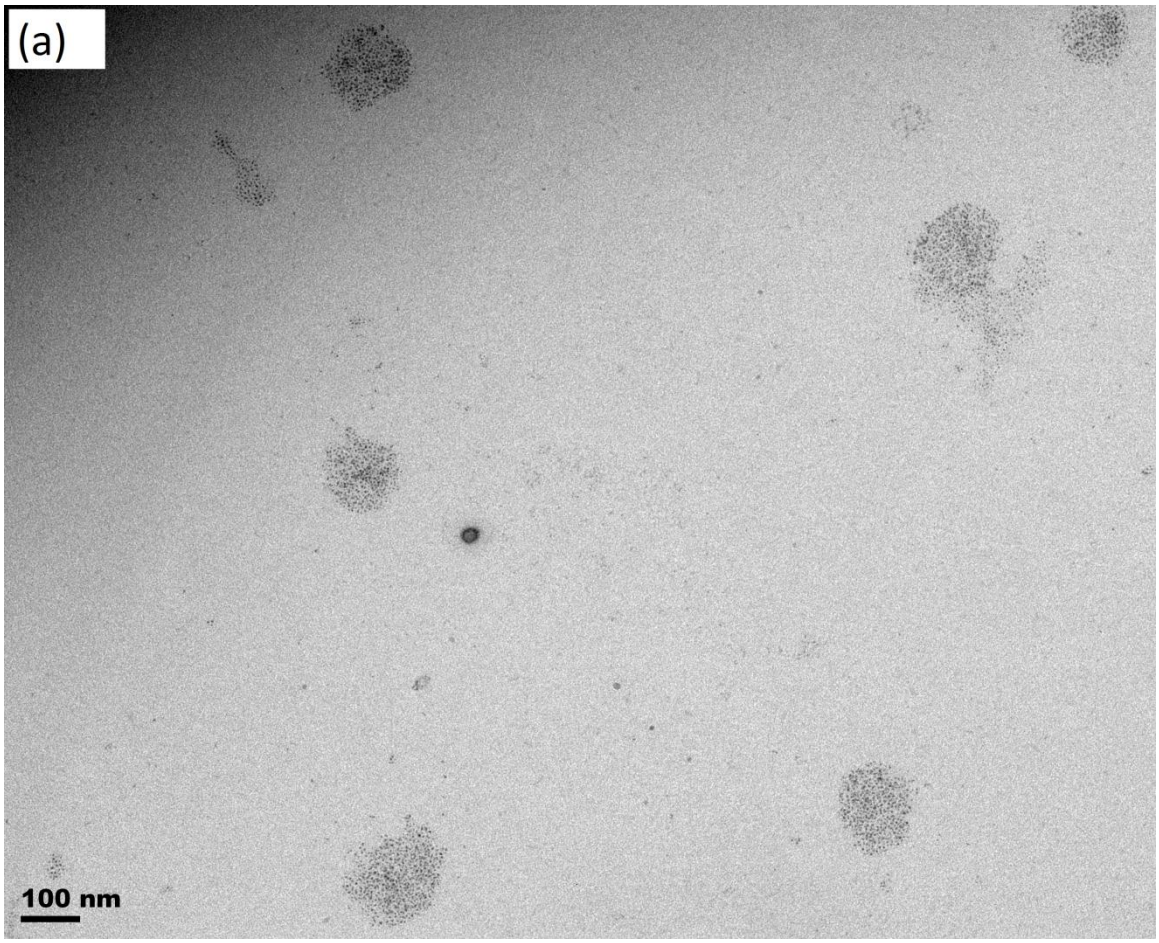

Figure S2 The lower magnified TEM image of sample prepared using OAM at 140 ^{o}C for waiting time (0.5 min).

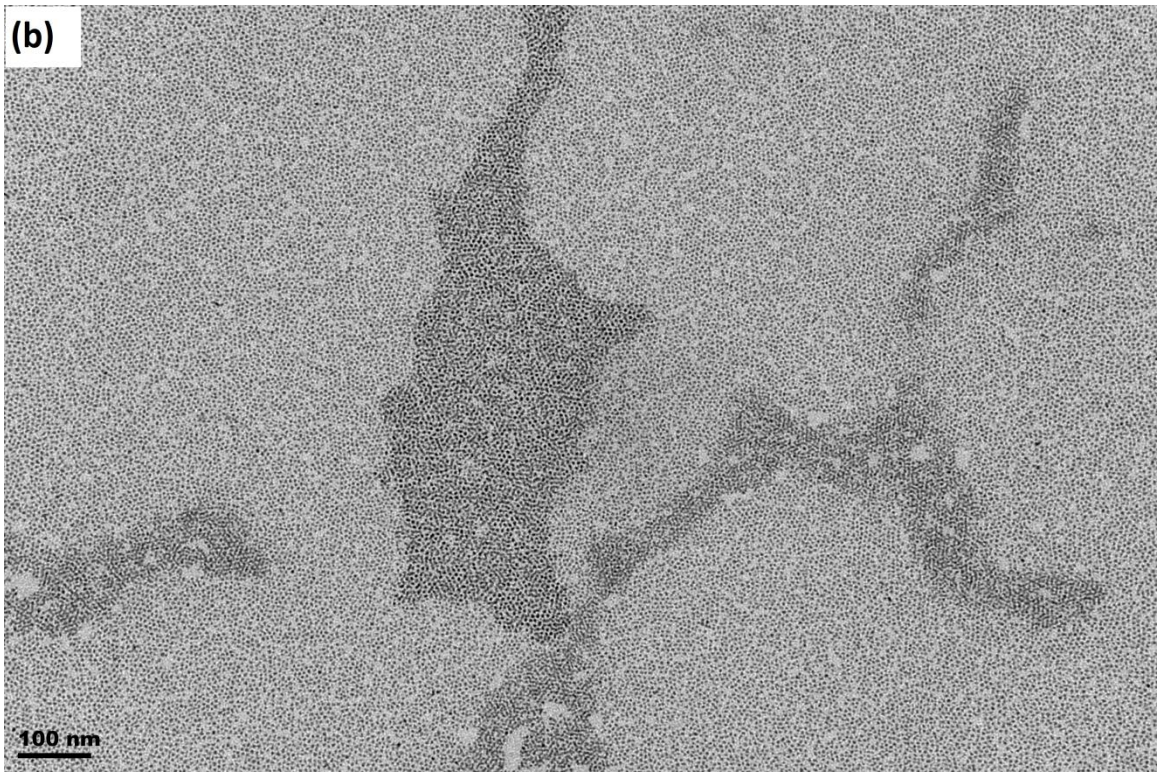

Figure S3 The lower magnified TEM image of sample prepared using OAM at 140 ^{o}C for waiting time (2 min).

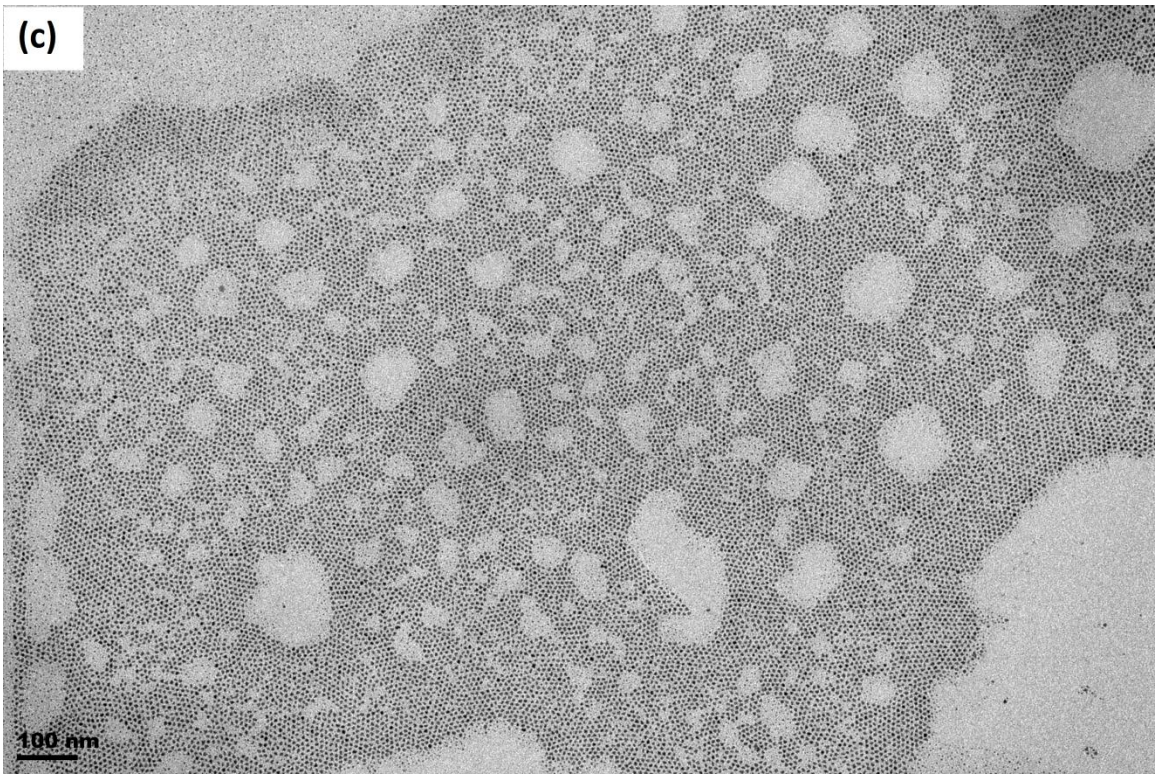

Figure S4 The lower magnified TEM image of sample prepared using OAM at 140 ^{o}C for waiting time (5 min).

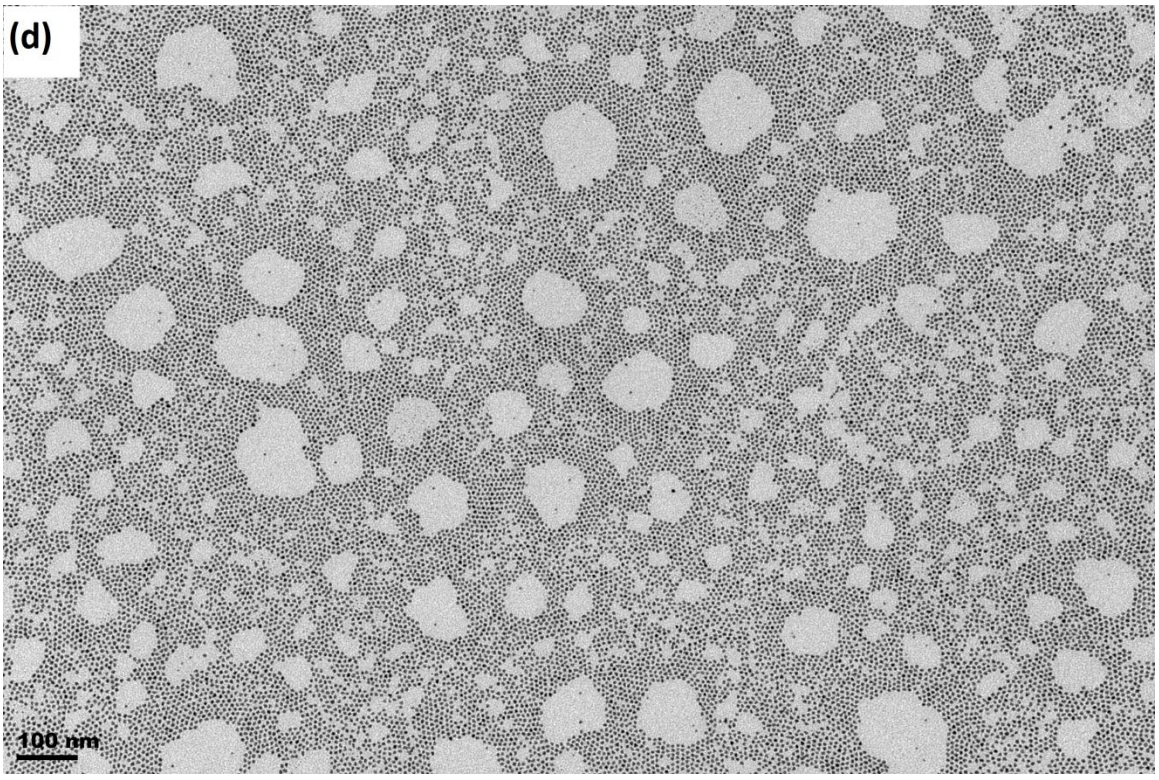

Figure S5 The lower magnified TEM image of sample prepared using OAM at 140 ^{o}C for waiting time (10 min).

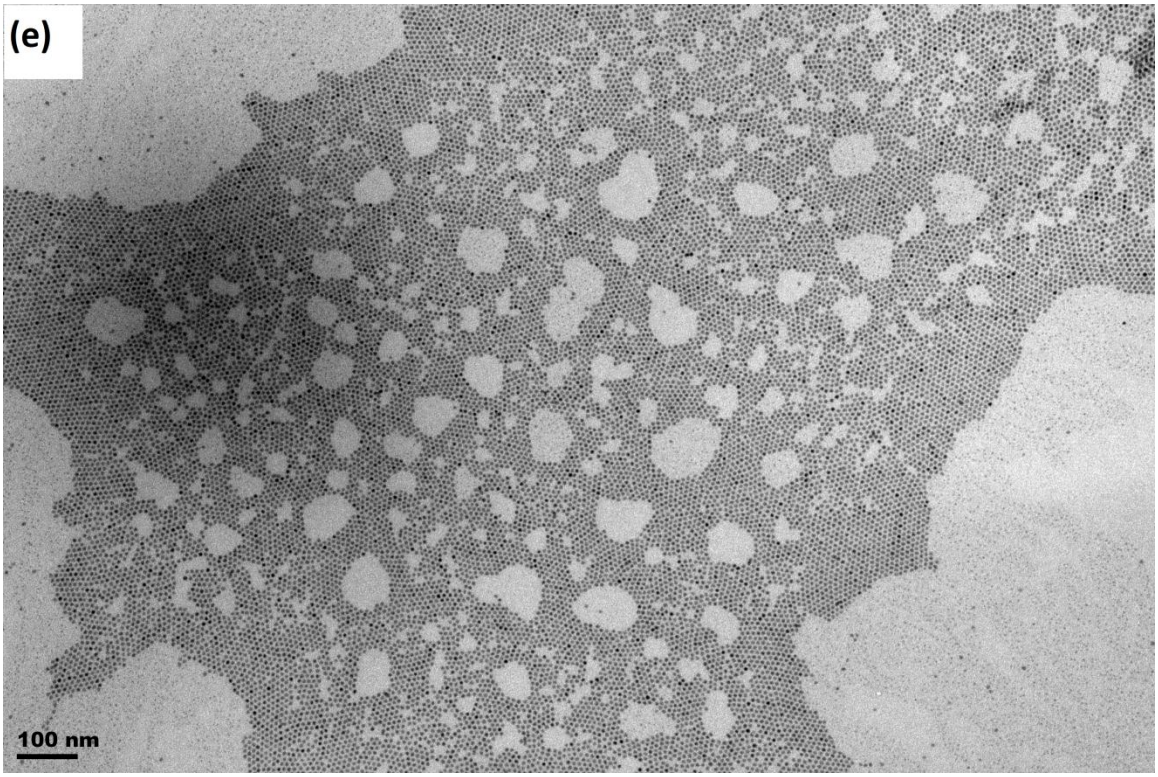

Figure S6 The lower magnified TEM image of sample prepared using OAM at 140 ^{o}C for waiting time (30 min).

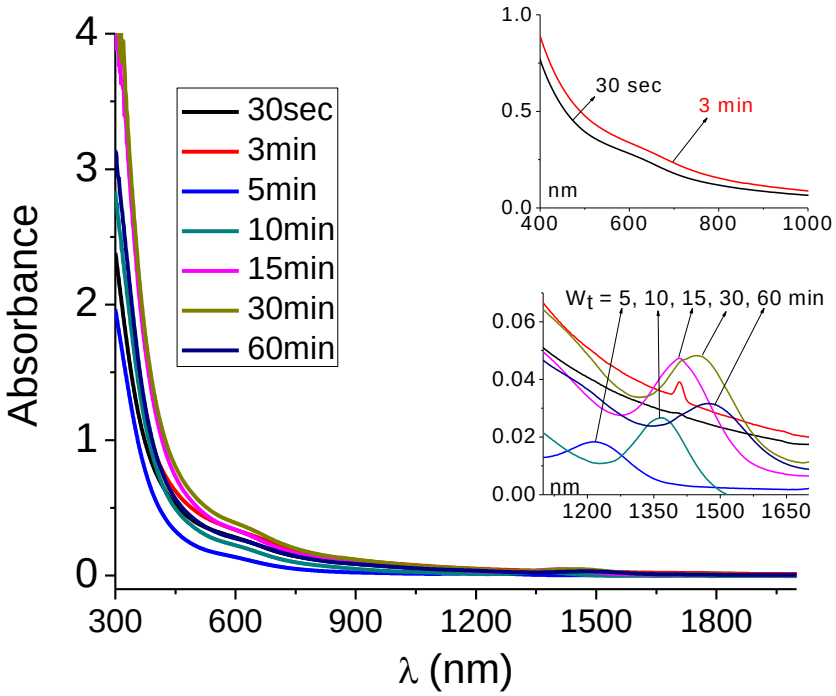

Figure S7 The UV-Visible-NIR spectra of sample prepared using OAM at 120 ^{o}C for different waiting times (0.5, 3, 5, 10, 15, 30 and 60 min).

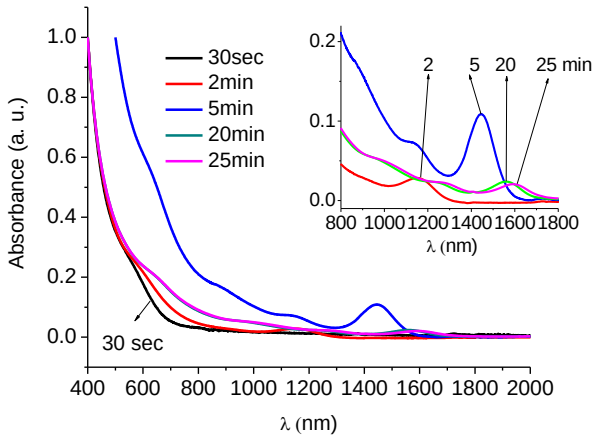

Figure S8 The UV-Visible-NIR spectra of sample prepared using OAM at 140 ^{o}C for different waiting times (0.5, 2, 5, 20 and 25 min).

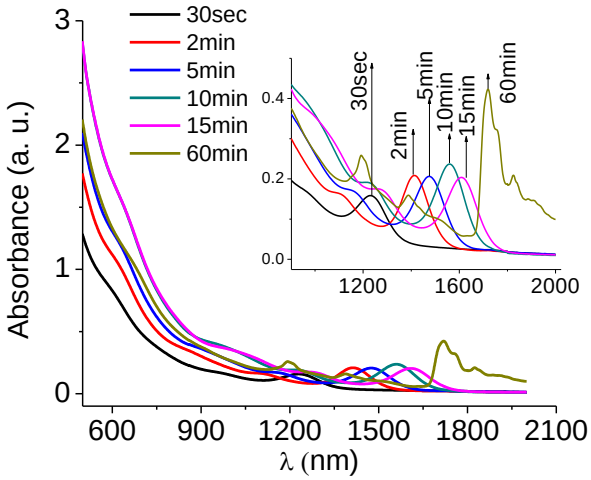

Figure S9 The UV-Visible-NIR spectra of sample prepared using OAM at 160 ^{o}C for different waiting times (0.5, 2, 5, 10, 15 and 60 min).

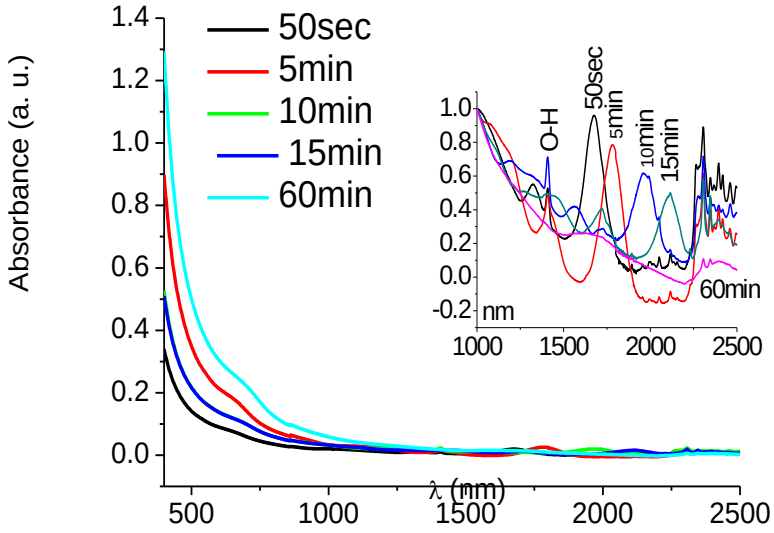

Figure S10 The UV-Visible-NIR spectra of sample prepared using OAM at 180 ^{o}C for different waiting times (0.5, 5, 10, 15 and 60 min).

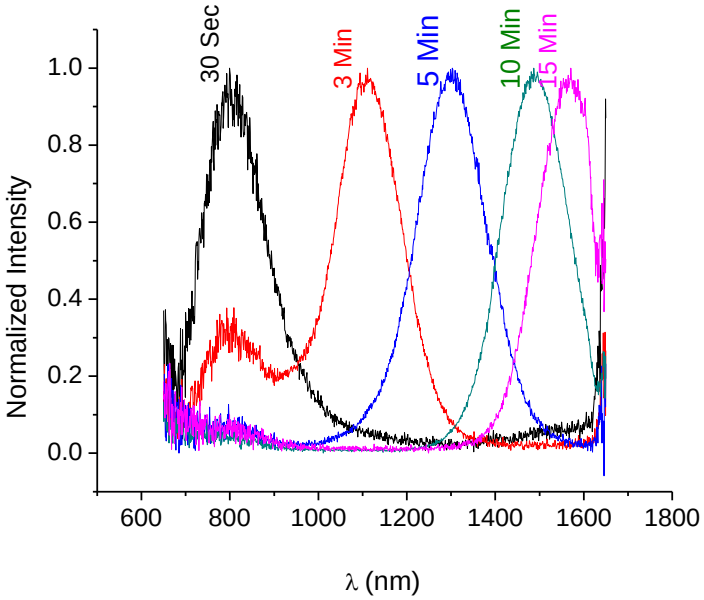

Figure S11 The PL spectra of sample prepared using OAM at 120 ^{o}C for different waiting times (0.5, 3, 5, 10, 15, 30 and 60 min).

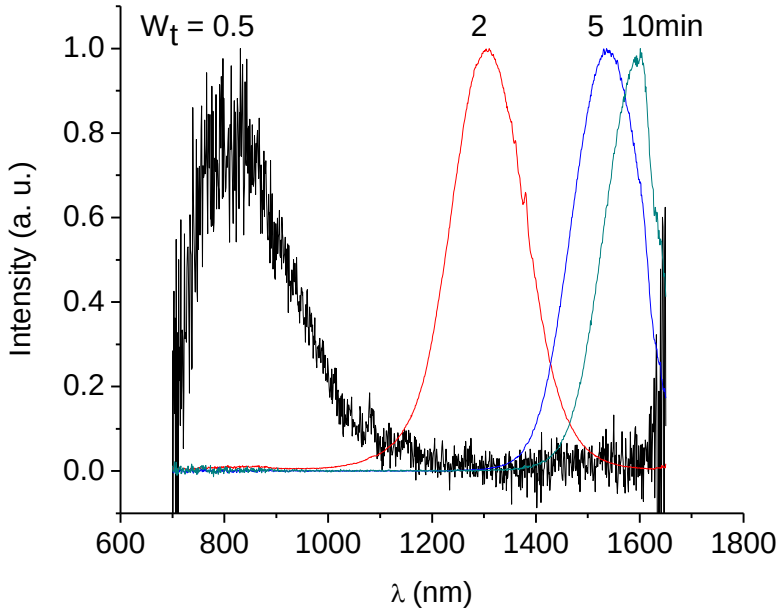

Figure S12 The PL spectra of sample prepared using OAM at 140 ^{o}C for different waiting times (0.5, 2, 5 and 10 min).

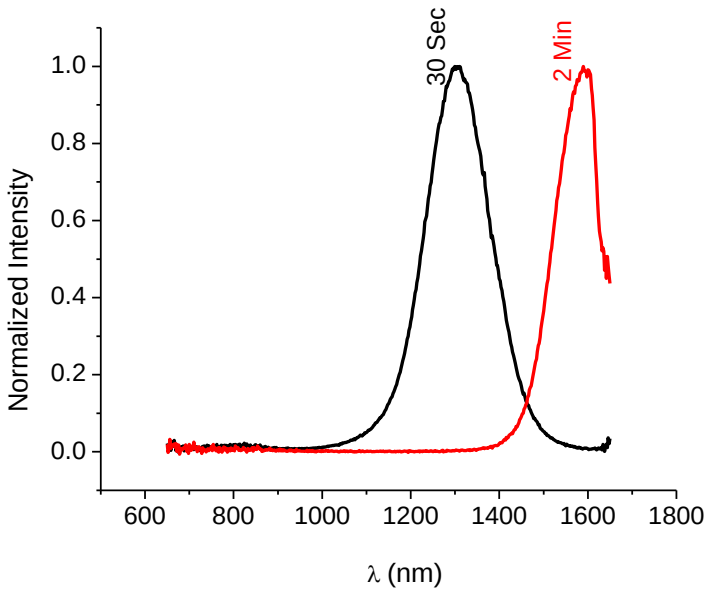

Figure S13 The PL spectra of sample prepared using OAM at 160 ^{o}C for different waiting times (0.5 and 2 min).

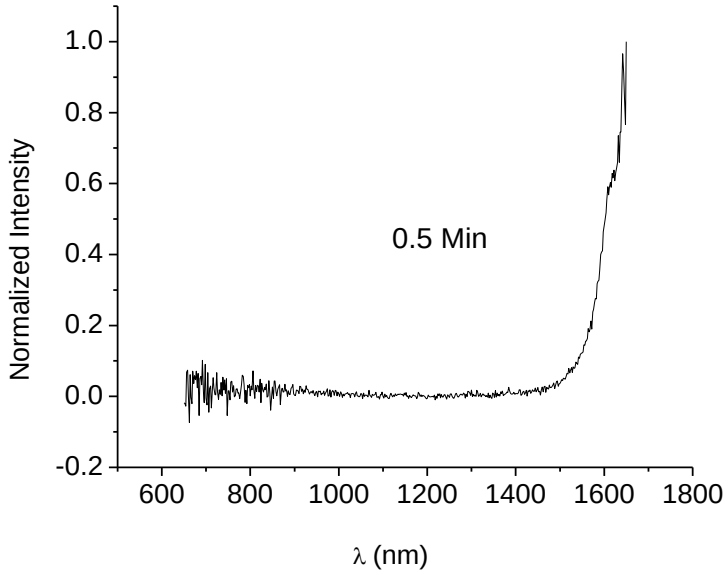

Figure S14 The PL spectra of sample prepared using OAM at 180 ^{o}C for waiting time (0.5 min).

Figure S15 Pictures of intermediate heat-treatments (22-140 ^{o}C) for dissolving PbO in Oleic acid and 1-Octadecene in the three necked round bottom flask under vacuum and precipitate (ppt) obtained after centrifugation at 5000 RPM and followed by washing with 100% ethanol.

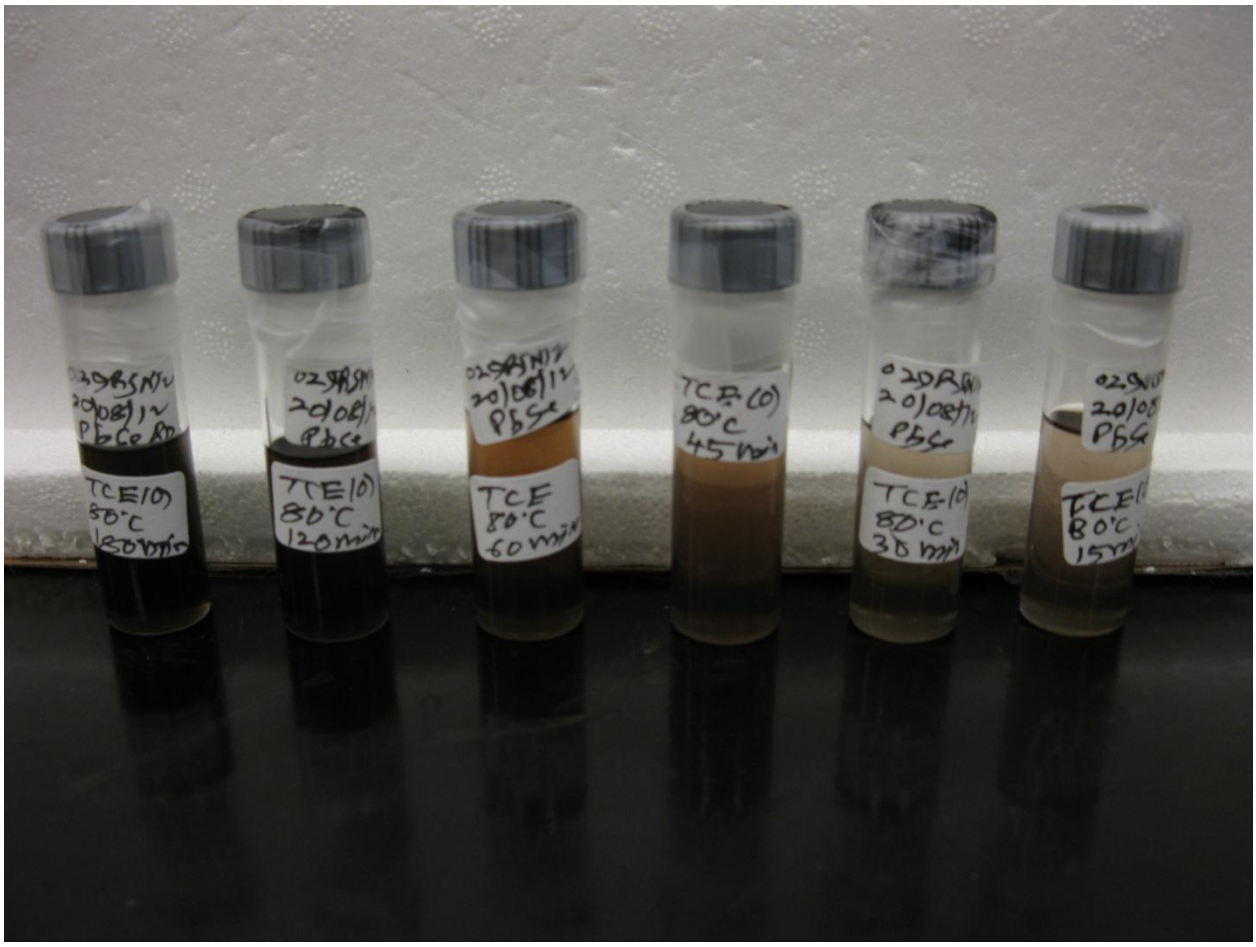

Figure S16 Pictures of the samples prepared using OAM at 80 ^{o}C for different waiting/delay times (W_t = 15, 30, 45, 60, 120 and 180 nm).

Section SA. Comparison XRD crystallite size, TEM particle size, Absorption and Emission bands of PbSe QDs prepared at 120 ^{o}C with waiting time of 5 minutes with and without OAM

A. XRD and TEM data

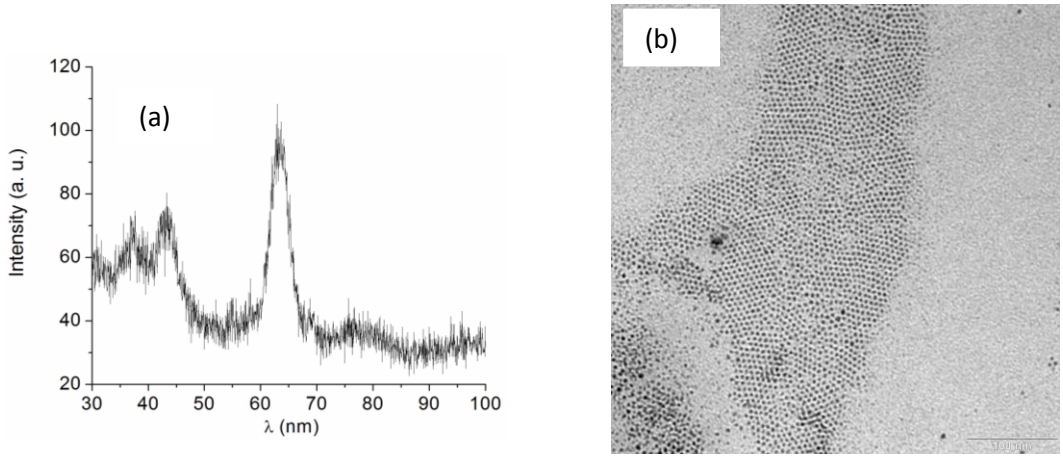

Figure S17. (a) The XRD patterns of PbSe QDs particles prepared at 120 ^{o}C with duration 5 min. Sample is prepared without OAM. Crystallite size is found to be 3.0 nm.

Sample prepared with OAM under same conditions of injection temperature and waiting time gives the crystallite size of ~ 3.2 nm.

(b) The TEM images of PbSe QDs particles prepared at 120 ^{o}C with duration 5 min. Sample is prepared without OAM. Particle size is found to be 3.8 nm.

Sample prepared with OAM under same conditions of injection temperature and waiting time gives the particle size of 4.0 nm.

B. Absorption and Emission data

Without OAM, sample shows the absorption band at 1277 nm

With OAM, sample shows the absorption band at 1225 nm.

Difference in the lowest energy bands = 52 nm

Without OAM, sample shows the emission band at 1300 nm

With OAM, sample shows the emission band at 1330 nm.

Difference in the lowest energy bands = 0 nm

It is concluded that difference in absorption or emission bands of QDs prepared under same conditions (injection temperature and waiting time) with and without OAM is ± 50 nm.