

Supporting Information.

Materials.

Hexadecylamine (HDA), Tetradecylamine (TDA), Oleylamine (OLA) were purchased from Aldrich. Selenourea and Cadmium acetate (hydrated) were purchased from Aldrich/Alpha Aesar, Octylamine (OA), Decylamine (DA) and Dodecylamines (DDA), from TCI, and Octadecylamine (ODA, 95%) from Alpha Aesar and 99% from Fluka.

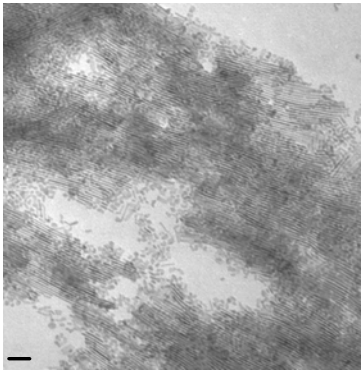
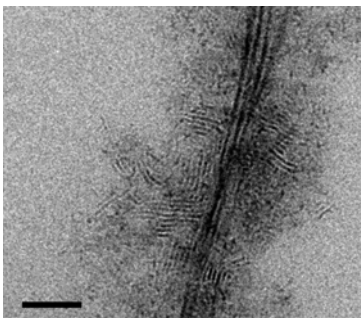
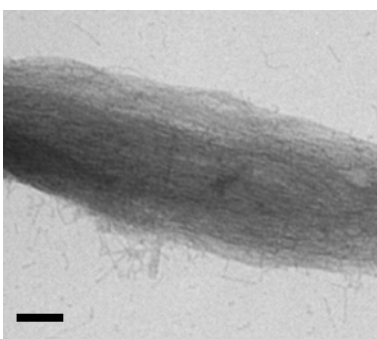
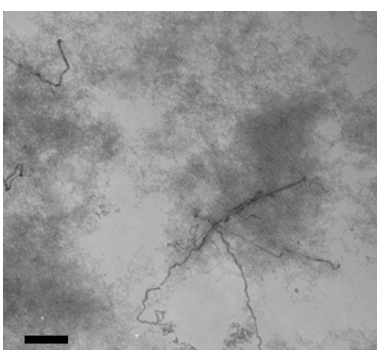
Methods.

Typical Synthetic Procedure for Nanowires

A stock solution of 0.07 g selenourea (99.9%, metal basis from Alpha Aesar) is prepared in 3.1 g ODA (95%, from Alpha Aesar). Selenourea is taken from Glove-box in a vial with septum and melted ODA is injected after degassing by purging Argon. The mixture is gently heated using heat gun with inserting a 5 ml glass syringe with flexible piston to reduce the access pressure inside. Heating and shaking continued till all the selenourea dissolved which would take almost 5 to 10 minutes. Continuous heating should be avoided as it might lead to dark precipitate, probably elemental Se. This solution is kept in a hot plate with shaker at above 50°C to prevent freezing of amine at room temperature.

Cadmium acetate, 0.018 g, 7.8×10^{-5} moles (Aldrich, Cat no-22,949-0) and 1.5 g DDA (95% from Alpha Aesar) are loaded in a three necked flask (or in a vial with septum to be placed in a hot plate with shaker), degassed by purging Argon (tight inert atmosphere is not necessary) at above 50°C and kept at 120°C to get a clear solution. 0.8 gm of stock selenourea (would contain 1.4×10^{-4} moles) and ODA solution is injected at 120°C and the reaction is left for hours with slow stirring. The solution turns yellow-red-dark-red within seconds of injection of selenourea. Samples were taken out periodically for analysis. A TEM picture corresponds to this reaction is given in Table 1 (A) without any size selective precipitation and after 8 hours of the reaction at 120°C.

Table 1. Synthetic protocol and results for multi-width nanowires.

	Synthetic condition	Remarks	TEM
A	Cd(Ac) ₂ 0.018 gm in 1.5gm DDA Selenourea, 0.017g in 0.79 g ODA	Most nanowires are ~2.5±0.35 nm diameter and dots/rods are ~2.5±0.35 nm and ~5.5±0.6 nm without size selective precipitation. This TEM picture is after 8 hrs at 120°C. (Bar = 50 nm)	
B	Cd(Ac) ₂ 0.018 gm in 1g DDA and 0.5g ODA Selenourea, 0.017g in 0.79 g ODA	Nanowires are ~2.5±0.3 nm and 5.5±0.65 nm diameters. Spherical dots with either diameter are present. This TEM picture is from the reaction 4 hrs at 120°C and 30 minutes at 140°C (Bar = 50 nm)	
C	Cd(Ac) ₂ 0.018 gm in 2gm OA Selenourea, 0.01g in 0.2 g OA	Thin Nanowires around 1.8±0.3 nm diameter are formed. Most of them are below 2 nm and some are fused. The TEM picture belongs to 6 hrs at 120°C and 20 min at 140°C (Bar = 100 nm)	
D	Cd(Ac) ₂ 0.018 gm in 2gm OA, 0.2 gm OLA Selenourea, 0.012 g in 0.8 g OLA	Most nanowires are ~1.9±0.3 nm and few 5.5±0.6 nm. The TEM picture is 8 hrs at 120°C. (Bar = 100 nm)	

Other Supporting Figures.

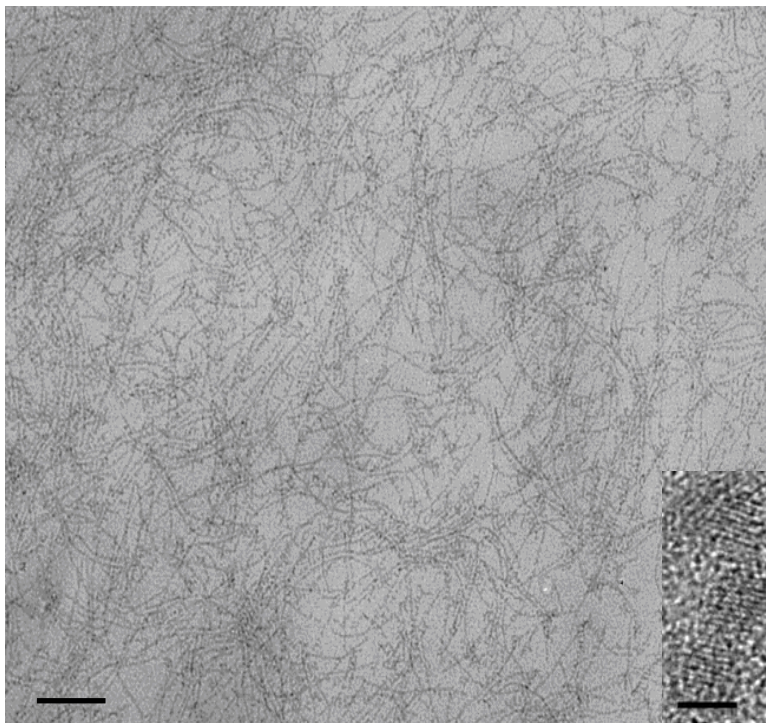


Figure S1. A large view of Pearl-shaped nanowires. Scale bar = 50 nm. Insert is a HRTEM of three connected dots. Insert scale bar = 2 nm.

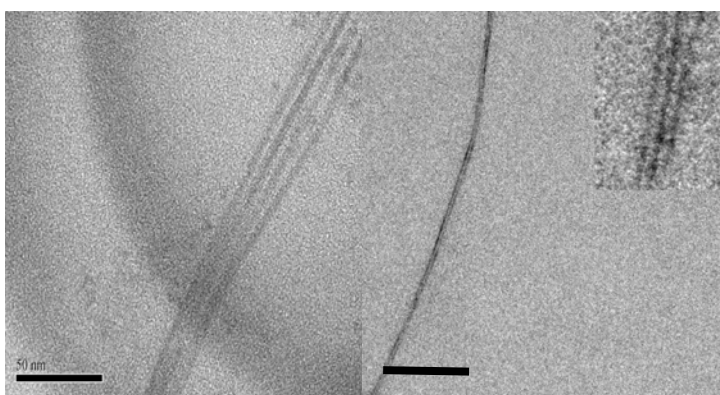


Figure S2. Two different segments of 5.6 nm width nanowires showing their self-assembly. Unlike narrow nanowires, these nanowires do not show a long range self-assembly. Inset in right panel is a magnified segment. The scale bar is 50 nm.

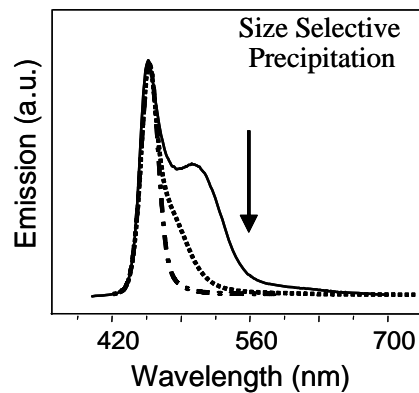


Figure S2. Photoluminescence spectra of pearl-necklace shaped pre-nanowires during successive size selective precipitation. Solid line belongs to the original solution and dotted line followed by dash-dotted line were taken with the supernatant portion after successive size selective precipitation.