

Supporting Information

Synthesis of monodisperse PbSe nanorods: a case for oriented attachment

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Oriented attachment of PbSe nanocrystals

Under different growth conditions for PbSe NRs (such as a different mole ratio of precursors or different temperature and time of growth), partially attached particles were observed in the TEM images (Figure S1). These show good examples of oriented attachment, where an individual particle keeps its own shape but forms a single crystal.

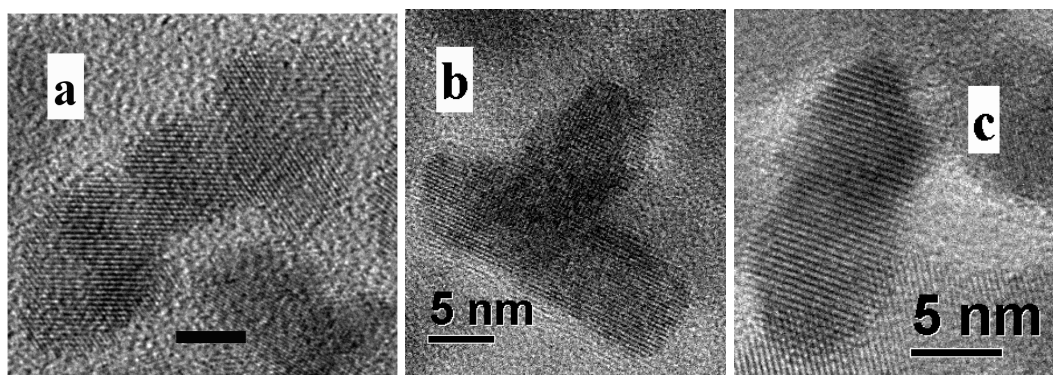


Figure S1. TEM images of (a) zigzag (b) T-shape (c) arrow structures of PbSe. (All scale bars are 5 nm.)

Separately, we mixed spherical PbSe QDs with Tris(diethylamino)phosphine (TDP) ligand (5% vol.) in a chloroform solution and found oligomerization of individual particles after several days (Figure S2). Previously Cho et al. showed reducing ligands accelerate oriented attachment;¹ this was consistent with the earlier studies of Kotov on oriented attachment of CdTe QD to form CdTe nanowires.² Here we added TDP and still saw attachment process under ligand concentrations up to ~ 5% by far in excess of which is need for surface coverage. The wire diameter is similar to the diameter of an individual QD, indicating that individual particles can make wires via oriented attachment but much more slowly at room temperature than under the NR reaction, conditions reported int this text (170 °C).

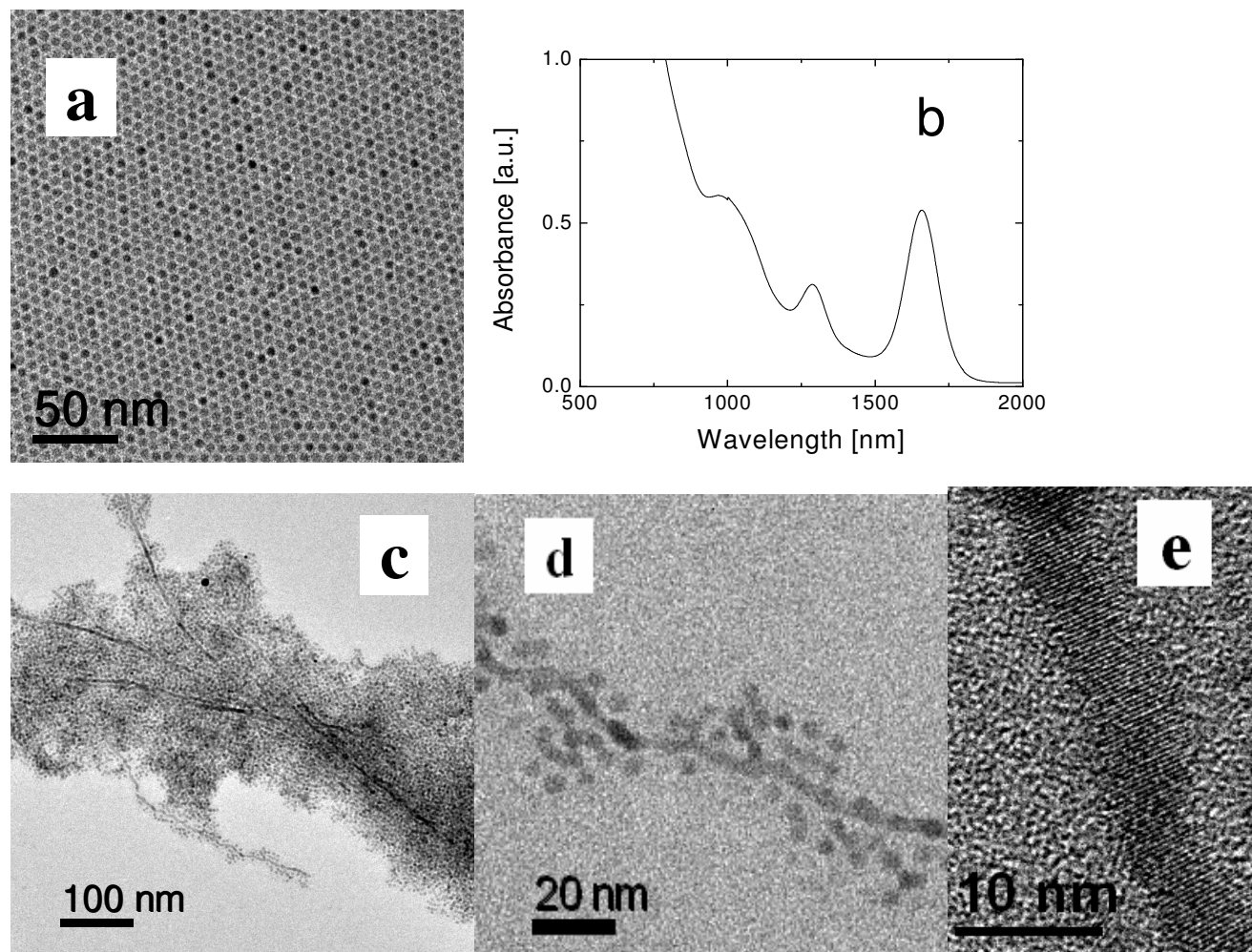


Figure S2. Transition from particles to wires (a) TEM image of initial PbSe QDs, (b) absorption spectrum of initial PbSe QDs, (c) TEM image of wire formation from PbSe QDs in solution after 3 days, (d) Magnified TEM image of (c) to show one individual wire and particles, and (e) high resolution TEM image to show a single-crystalline wire.

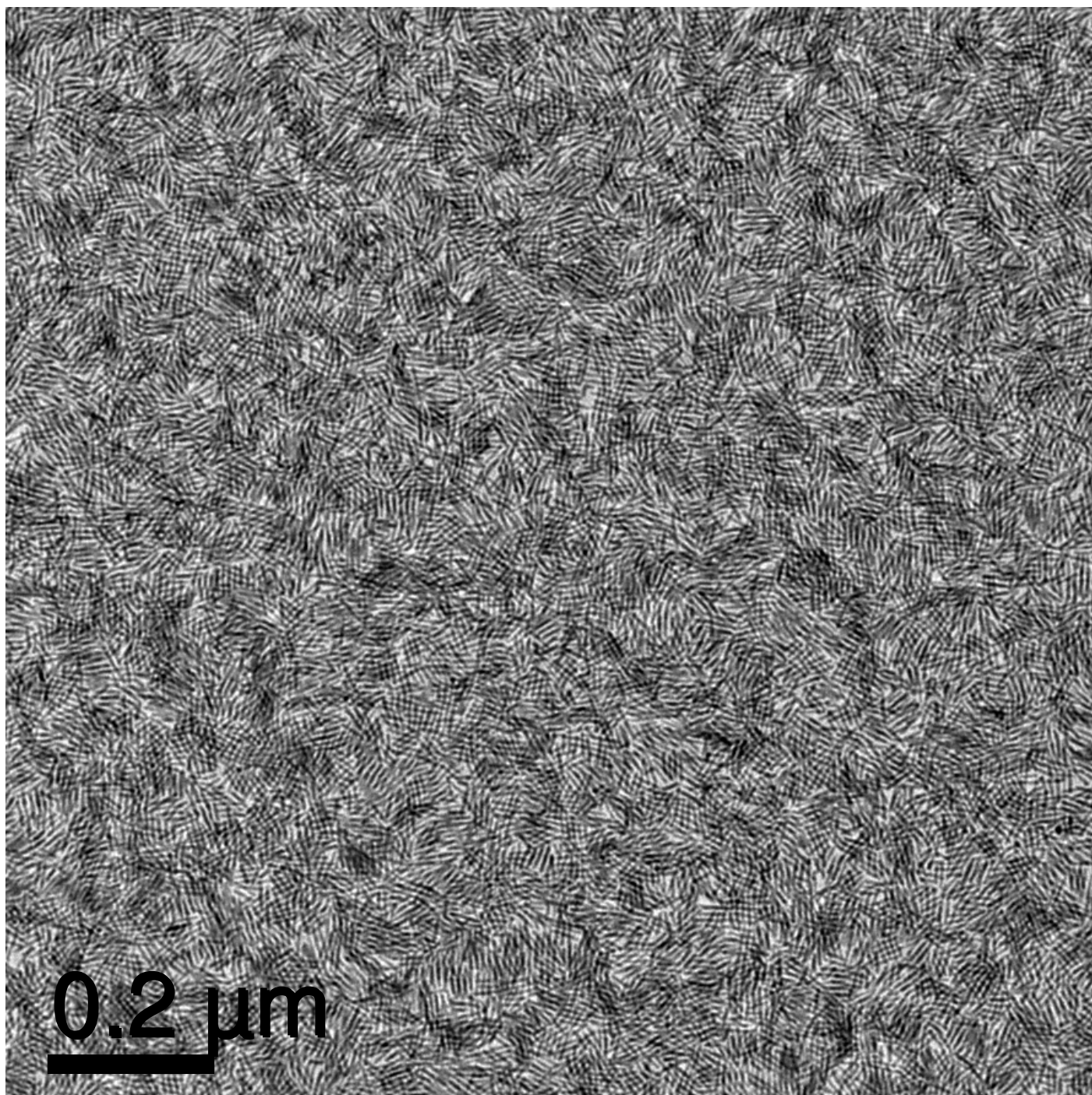


Figure S3. Large area TEM image of PbSe NRs showing monodisperse PbSe NRs after size selective precipitation process.

References

- (1) Cho, K. S.; Talapin, D. V.; Gaschler, W.; Murray, C. B. *Journal of the American Chemical Society* **2005**, *127*, 7140-7147.
- (2) Tang, Z. Y.; Kotov, N. A.; Giersig, M. *Science* **2002**, *297*, 237-240.