



Tri-n-octylphosphine (TOP) [15-6655] and Trioctylphosphine oxide (TOPO) [15-6660/15-6661] are used as surfactant/capping agents for the colloidal synthesis of CdE (E=S, Se, Te) type semiconductor nanocrystals (Quantum Dots).^[1] TOP and TOPO prevent nanoparticles from aggregation and uncontrolled growth as well as stabilize them in solution. In addition, TOPO serves as a reaction medium. Its high boiling temperature (411.2°C) facilitates reactions leading to homogeneous nucleation and controlled growth of the particles. TOPO/TOP coated Quantum Dots (QDs) are compatible with organic solvents such as chloroform or toluene.

TOP with a lone electron pair on the phosphorus atom serves as a common reagent in the chemical synthesis of II-VI, III-V and IV-VI QDs.^[1] These pair electrons exhibit strong solvent ability toward selenium (93-3416; 34-0090), sulfur (93-1616; 93-1617; 93-1618) and tellurium (93-5222; 52-5200; 93-5220) powders forming thus TOP-E anion precursors for selenation, sulfonation and telluration of metal cations.

In TOP/TOPO media, CdSe QDs are synthesized starting with Me_2Cd (48-5040) and $(TMS)_2Se$.^[1] For selenation, use a TOPSe solution prepared by mixing elemental Se (93-3416 or 34-0090) and TOP.^[2] Alternatively, CdSe QDs can be prepared in TOPO by injection of $Me_2Cd:Se$ powder solution in tributylphosphine^[3] or using CdO (93-4835, 93-4817, 48-0800) as a precursor.^[4] TOPO is used for the preparation of core-shell structured QDs, e.g. CdSe/ZnS^[5] or CdSe/CdS/ZnS^[6] and Perovskite type QDs.^[7]

For other long-chained alkylphosphonic acids used in the colloidal synthesis of QDs, or other types of nanoparticles, please review the following Strem product numbers: 96-1525 (Kit); 15-0958; 15-1835; 15-2400; 15-2410; 15-3510; 15-3520; 15-5145.

References:

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2. *J. Mater. Chem. B*, **2013**, *1*, 1381.
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6. *J. Phys. Chem. B*, **2004**, *108*, 18826.
7. *ACS Nano*, **2017**, *11*, 10373.

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