

A Controlled Growth Process to Design Relatively Larger Size Semiconductor Nanocrystals

Santanu Jana, Bhupendra B. Srivastava and Narayan Pradhan*

Department of Materials Science and Centre for Advanced Materials, Indian Association
for the Cultivation of Science, Kolkata-700032, India.

Email: camnp@iacs.res.in

Supporting Information File

Instrumentation

Optical measurements:

UV-Vis measurements were taken with Agilent UV-Vis spectrophotometer. Photoluminescence spectra were collected using a Horiba Jobin Yvon Fluoromax -4 spectrofluorometer.

Transmission Electron Microscopy:

TEM images were taken on a JEOL-JEM 2010 electron microscopy using 200kV electron source. Specimens were prepared by dropping a drop of nanocrystal solution in chloroform on a carbon coated copper grid, and the grid was dried under in air.

X-ray Diffraction (XRD):

XRD of the doped sample was taken by Bruker D8 Advance powder diffractometer, using Cu K α ($\lambda = 1.54 \text{ \AA}$) as the incident radiation.

Nuclear Magnetic Resonance (NMR):

NMR measurement was done using a 9.5 GHz JEOL spectrometer operated at X-band frequency.

Supporting Figures:

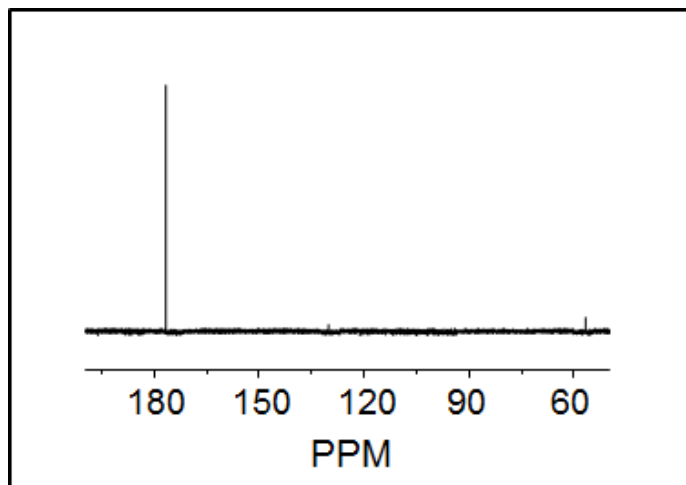


Figure S1. C^{13} spectra of thiourea in MeOD solvent.

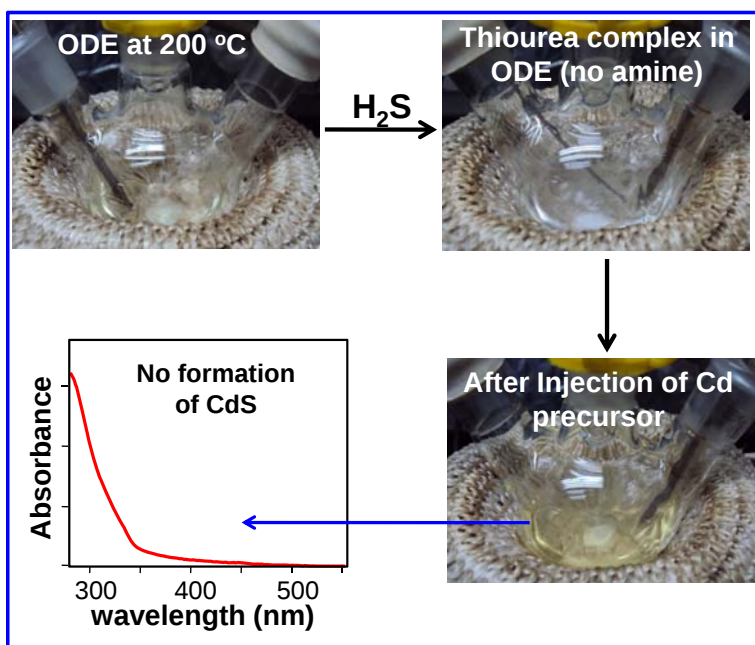


Figure S2. Digital pictures obtained from different stages of the reaction protocol using thiourea in ODE and in absence of the alkylamine. The reaction carried out under similar condition does not show the formation of CdS. Hence, this suggests that there is no decomposition of 1-Octadecylthiourea without amine.

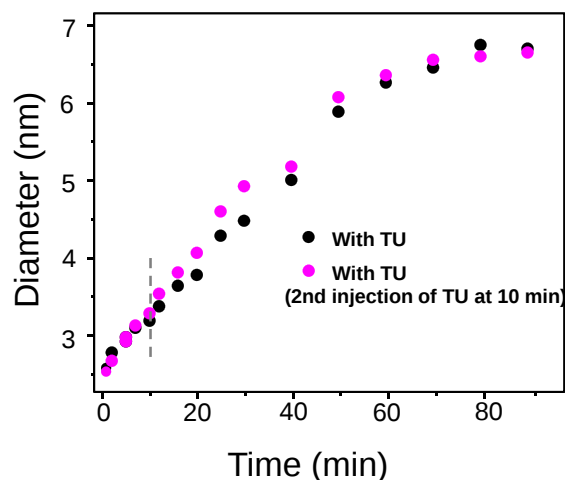


Figure S3. Changes of the particles size with successive injection of thiourea (TU) solution. Both the reaction condition is same; both cases 0.2 ml of thiourea precursor has been injected. But the black points are injection of thiourea precursor at a time initially and the pink points are injection of same amount of thiourea precursor by two part, after initial injection (0.1 ml), remaining thiourea precursors (0.1 ml) has been injected after 10 min in the reaction medium.

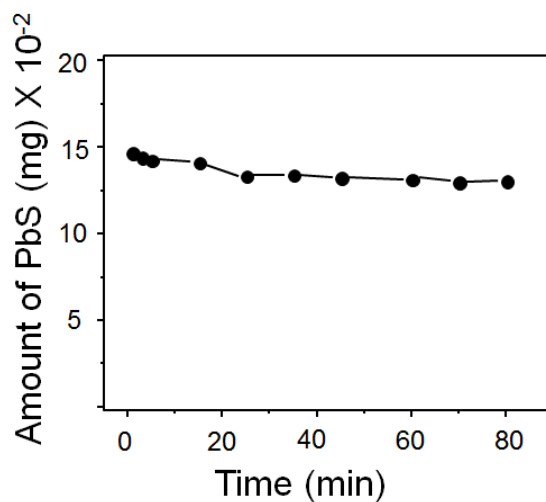


Figure S4. The formation of amount of PbS with time by taking same amount (2 ml) of gas from the upper surface of the reaction pot.

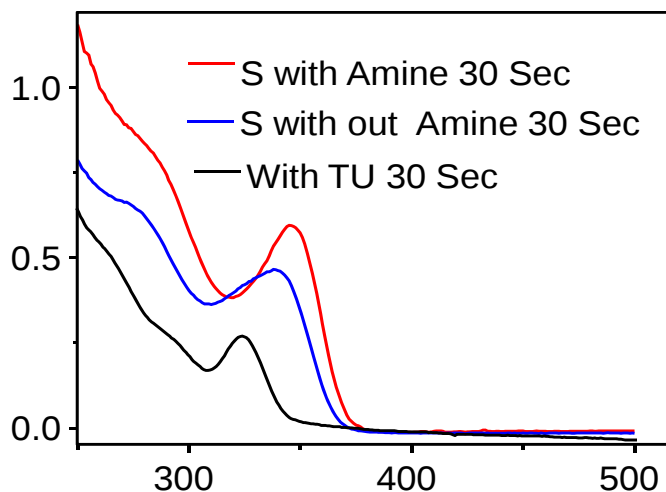


Figure S5. UV-Vis spectra of the formation of CdS nanocrystals using thiourea complex and elemental S with and without amine. For each case the reaction parameters are kept identical and the sample collected from the reaction system is ~0.5 ml. Samples are collected just after 30 sec of injection of the precursors.

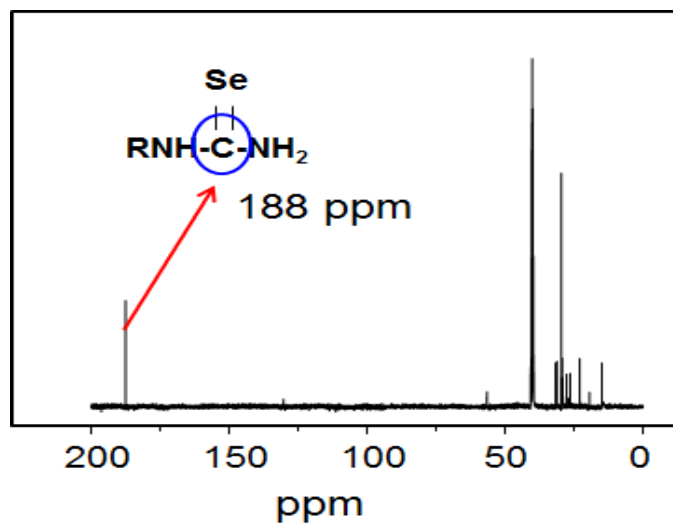


Figure S6. C^{13} NMR spectra of selenourea complex where R is $C_{18}H_{39}$, where only selenourea in MeOD solvent gives the peak at 179.2 ppm. The shift of this peak of selenium containing carbon is due to formation of selenourea complex. This complex is

formed when selenourea reacts with long chain amine (ODA) and it forms an intermediate complex same like thiourea. This complex acts as a Se precursor for large size ZnSe synthesis.