Electronic Grade and Flexible Semiconductor Film Employing Oriented Attachment of Colloidal Ligand-Free PbS and PbSe Nanocrystals at Room Temperature

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Electronic Supplementary Information (ESI)

Materials:

Lead (II) nitrate (sigma- aldrich, purity ≥ 99%), formamide(FA, fluka analytical , purity 99.0%), ammonium sulphide (40 - 48 wt % solution in water, aldrich), sodium selenide (alfa aesar, purity 99.8%), acetonitrile (dry, S D fine chem Ltd), n-butanol (Analytical reagent, Rankem), ethanol (99.9% AR, S D fine chem Ltd), sodium chloride (AR, Rankem), colloidal silver liquid (TED PELLA, INC), polyethylene terephthalate (PET substrate, aldrich). All the chemicals were used without any further purification.

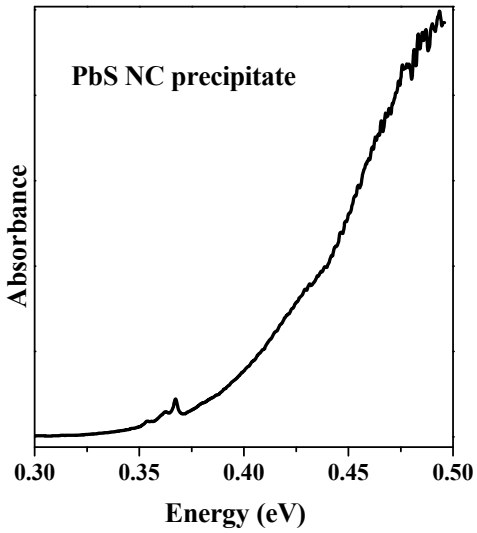

Figure S1: Infra-red absorption spectrum of PbS nanocrystal (NC) precipitate.

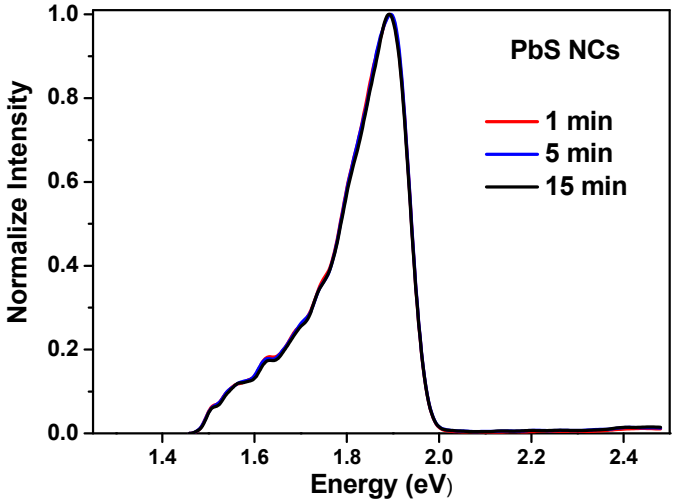

Figure S2: Photoluminescence (PL) spectra for same sample of ligand-free PbS nanocrystals (NCs) in FA at different time after stopping the reaction immediately after injecting S^{2-} solution in Pb^{2+} solution.

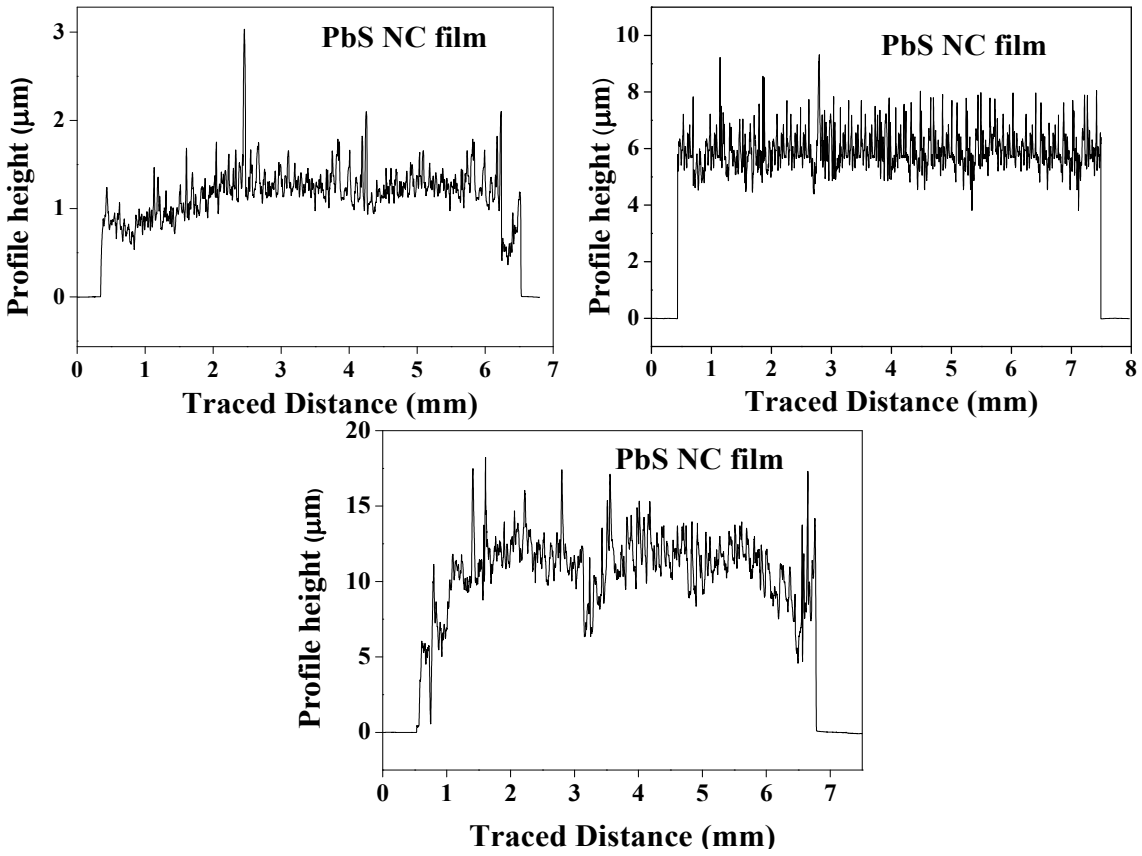

Figure S3: Surface profilometry of three different PbS films showing the control over film thickness in the range of 1 to 15 μm.

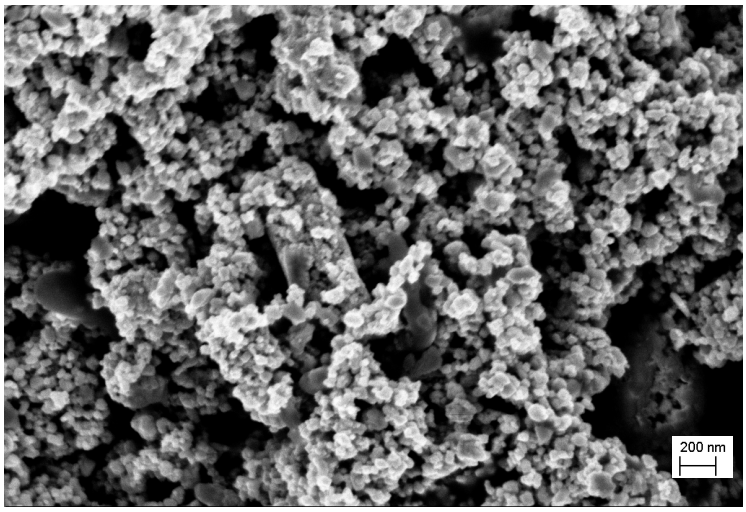

Figure S4: FESEM image of PbS NC film on glass substrate processed at 25 ^{o}C.

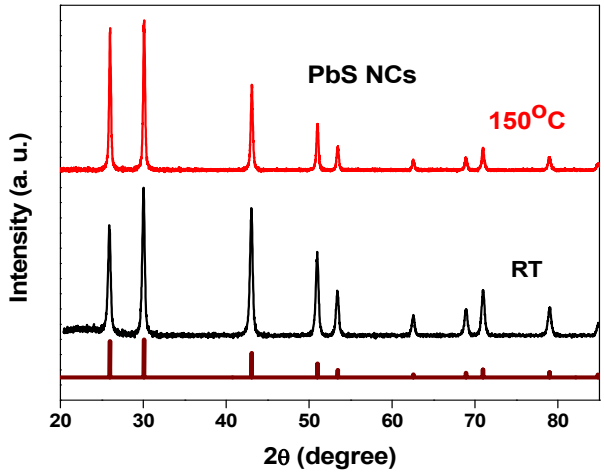

Figure S5: Powder x-ray diffraction (XRD) patterns of PbS NC films processed at room temperature (RT) and 150 ^{o}C.

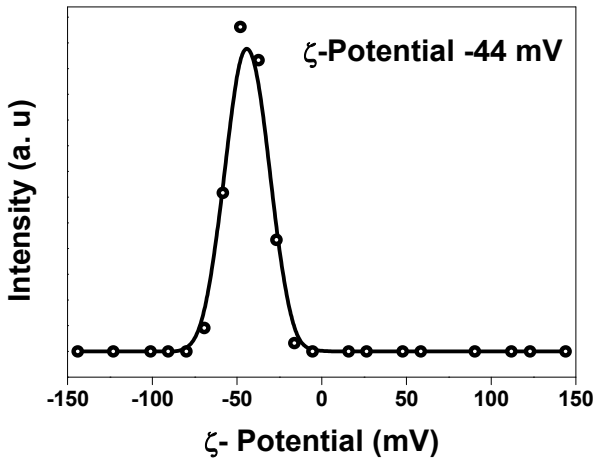

Figure S6: ζ-potential of ligand-free colloidal PbSe NCs dispersed in FA. Open circles represents the experimental data and the solid line is a guide to eye.

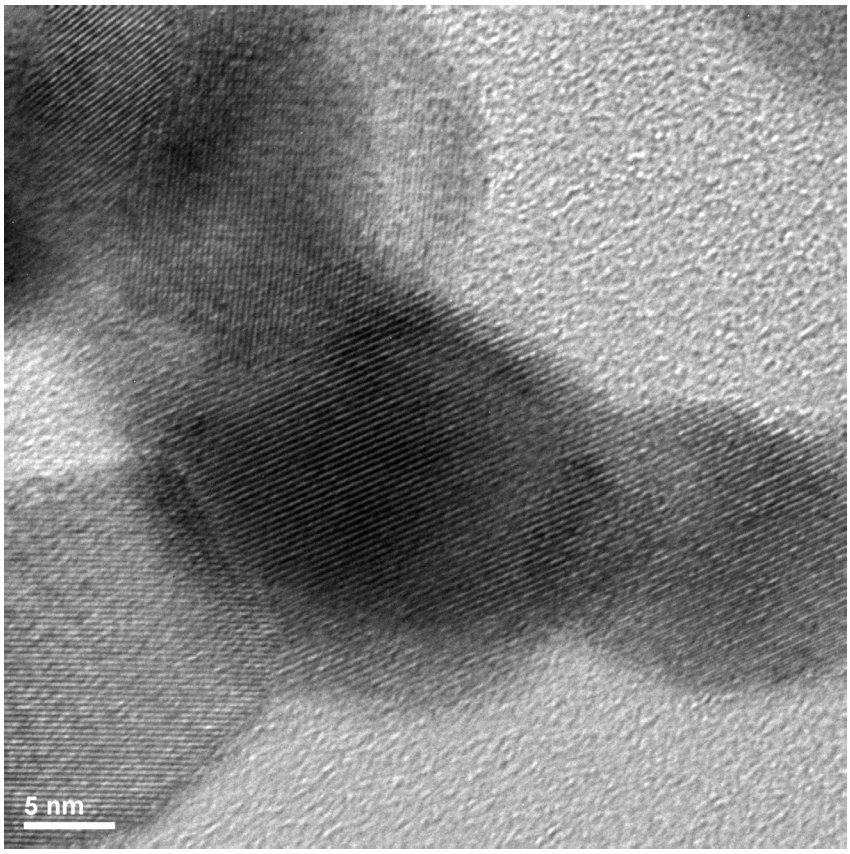

Figure S7: HRTEM image of ligand-free PbSe NC precipitate.

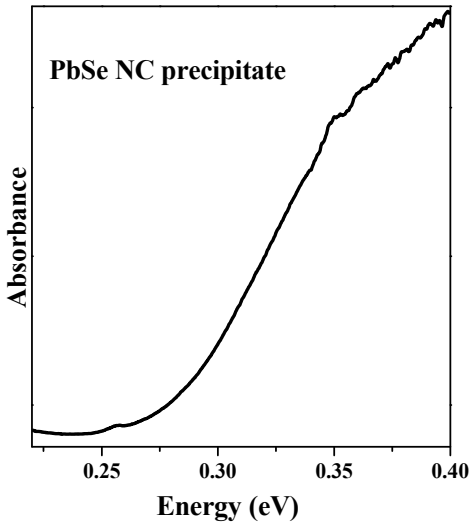

Figure S8: Infra-red absorption spectrum of PbSe nanocrystal (NC) precipitate.

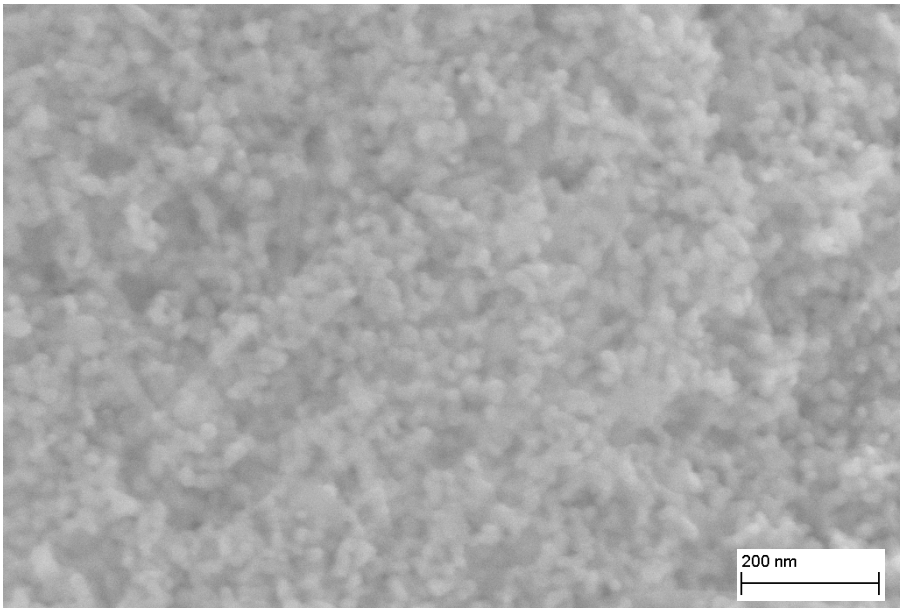

Figure S9: FESEM image of PbSe NC film on glass substrate processed at 25 ^{o}C.

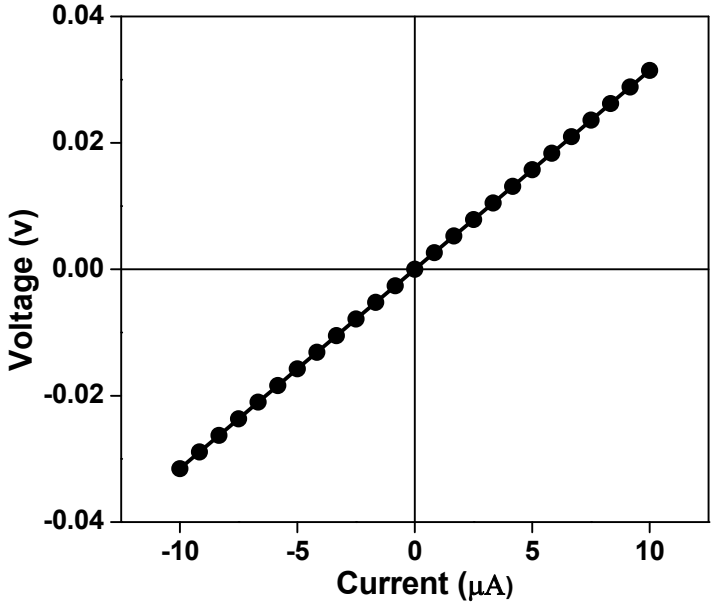

Figure S10: Four-probe Current (I) vs voltage (V) plot for PbSe NC film on glass substrate after annealing at 150 ^{o}C. Electrical measurement was done at room temperature.

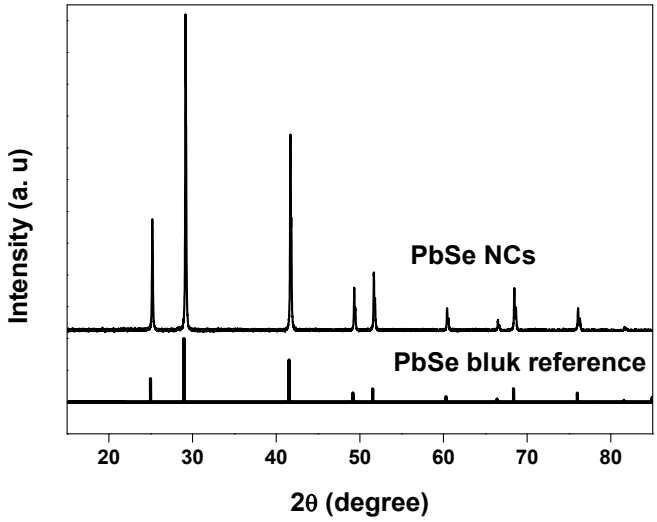

Figure S11: Powder XRD pattern of PbSe NC film after annealing at 150 ^{o}C.