Supporting information

Equilibrium Self-assembly of Close-packed Ordered PbTe Nanocrystal Thin Film and Near-infrared Photoconductive Detector

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Chemicals

Trioctylphosphine (TOP, technical grade 90%), 1-octadecene (ODE, technical grade 90%); tellurium powder (99.999%); Oleic acid (OA, AR grade), hexane (AR grade), methanol (AR grade), acetone (AR grade), chloroform (AR grade), ethylenediamine (EDA, AR grade) and tetrachloroethylene (AR grade) were used without further purification.

PbTe NCs Synthesis

The synthesis of PbTe NCs includes preparation of precursors, nucleation, growth, isolation, and purification. Lead oleate precursor was synthesized in a single, three-neck flask. PbO (0.221 g) and oleic acid (0.878 mL) were dissolved in ODE (5.98 mL), and the mixture was heated to 130 °C for 0.5 h under Argon to give a lead oleate solution. The lead oleate solution was then heated to 180 °C. In the meantime, tellurium powder was dissolved in trioctylphosphine (TOP) at 70 °C to obtain a clear yellow/green solution. The resulting trioctyphosphine telluride (TOPTe) solution (1.00 mL, 0.500 M) was injected swiftly into the lead precursor solution to start nucleation under vigorous stirring. Several seconds later, ODE in equal volume was injected to end the nucleation. The reaction mixture was subsequently maintained at 150 °C for several minutes and then promptly cooled to room temperature using a water bath to assure isolation and purification. When the temperature reached 30 ~ 40 °C, the crude solution was successively treated with mixture solvents of chloroform / hexane (1:1 by volume) and acetone / methanol (1:1 by volume) to quench PbTe NCs by centrifugation. The precipitated NCs were next re-dissolved in hexane /

chloroform (1:1) and precipitated with acetone / methanol (1:1). Finally, the NCs were re-dispersed in TCE for optical studies.

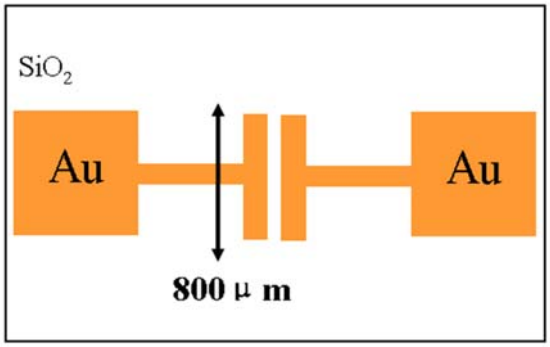

Figure S1. Schematic of Si/SiO_2 substrate structure in the experiment. Ti/Au contacts are microfabricated on silicon oxide surface.

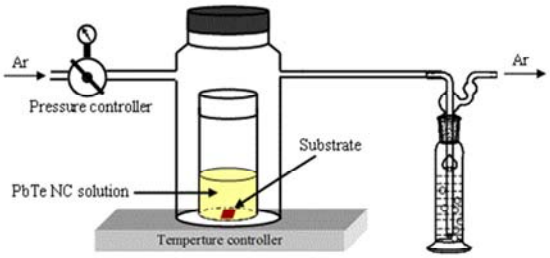

Figure S2. Scheme of the experimental setup for assembling PbTe NC thin films with the NC solution evaporation rate controlled by changing the reaction temperature and velocity of Argon flow.

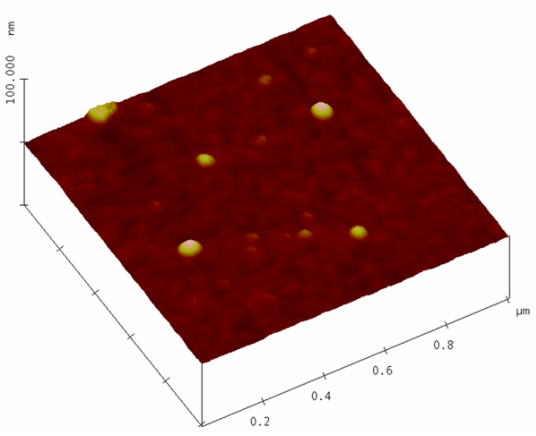

Figure S3. AFM morphology of the PbTe NC thin film on Si/SiO_2 substrates assembled at 45 °C for 2 h

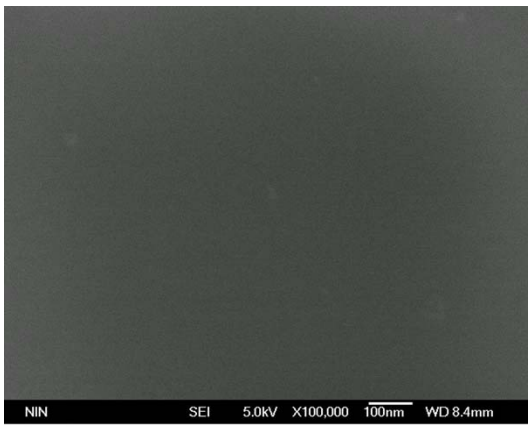

Figure S4. SEM image of the PbTe NC thin film assembled at 45 °C for 2 h

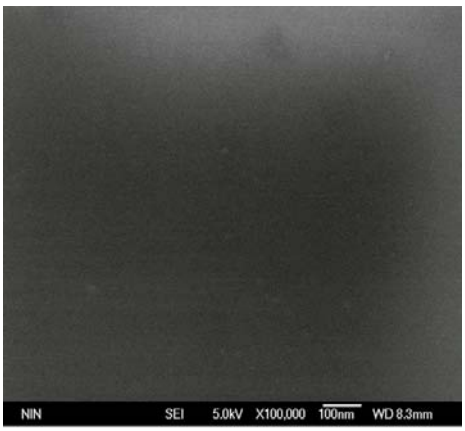

Figure S5. SEM image of the PbTe NC thin film assembled at 45 °C for 12 h

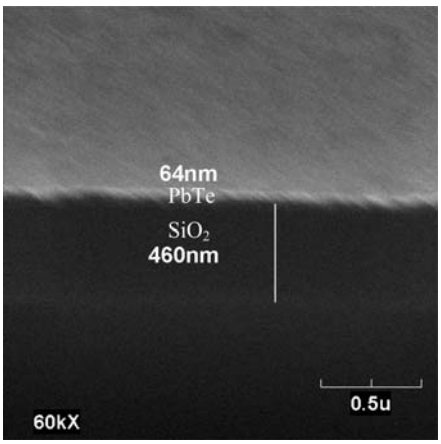

Figure S6. SEM image of the PbTe NC thin film thickness assembled at 45 °C for 12 h

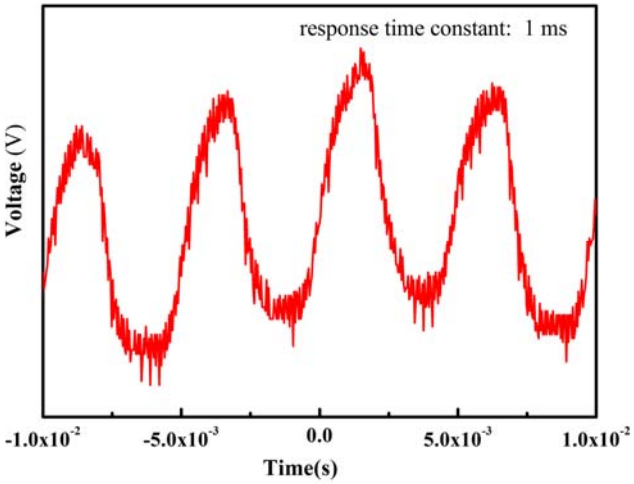

Figure S7. The time-resolved photoresponse of PbTe NC films.