Supplemental Information

Quantum Dot Based 3D Printed Woodpile Photonic Crystals Tuned for the Visible

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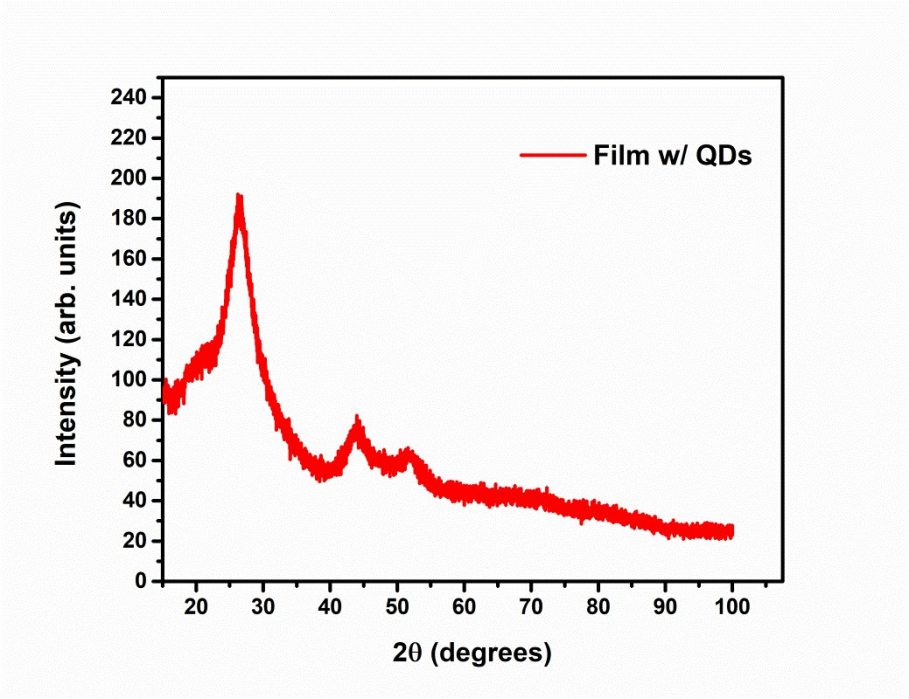

Fig. S1 XRD pattern of a polymer film functionalized with CdS quantum dots (QDs).

The XRD pattern of a polymer film functionalized with CdS quantum dots (QDs) is displayed in Fig. S1. The spectrum exhibits three broad peaks centered at 2θ values of 26.5°, 44° and 51.8° attributed to the (111), (220) and (311) planes of cubic CdS, respectively.

CdS exists in nature in the form of two different minerals; i) hexagonal greenockite in the bulk material and ii) cubic hawleyite in nanomaterials. Note that a mixture of hexagonal and cubic phases is routinely observed for CdS nanoparticles. The reason for this is that the two phases have similar energy levels and the transformation from one to another is most feasible. However, the particle size plays an important role in determining the crystal structure. By reducing the size, the crystal lapses

into the cubic structure from the hexagonal one for particle sizes below 5 nm,[S1] whereas above this size the material comprises a mixture of both phases.

The hexagonal structure has three distinct and closely located peaks at $2\theta = 24^{o}$, 26^{o} and 29^{o}, which are quite close to the intense (111) peak of the cubic structure. In the present pattern, the peak at 26.55^{o} is symmetric and the (103) peak of the hexagonal phase at 48^{o} is absent. This suggests that the nanoparticles prepared in the current work exhibit a cubic lattice due to their small size.

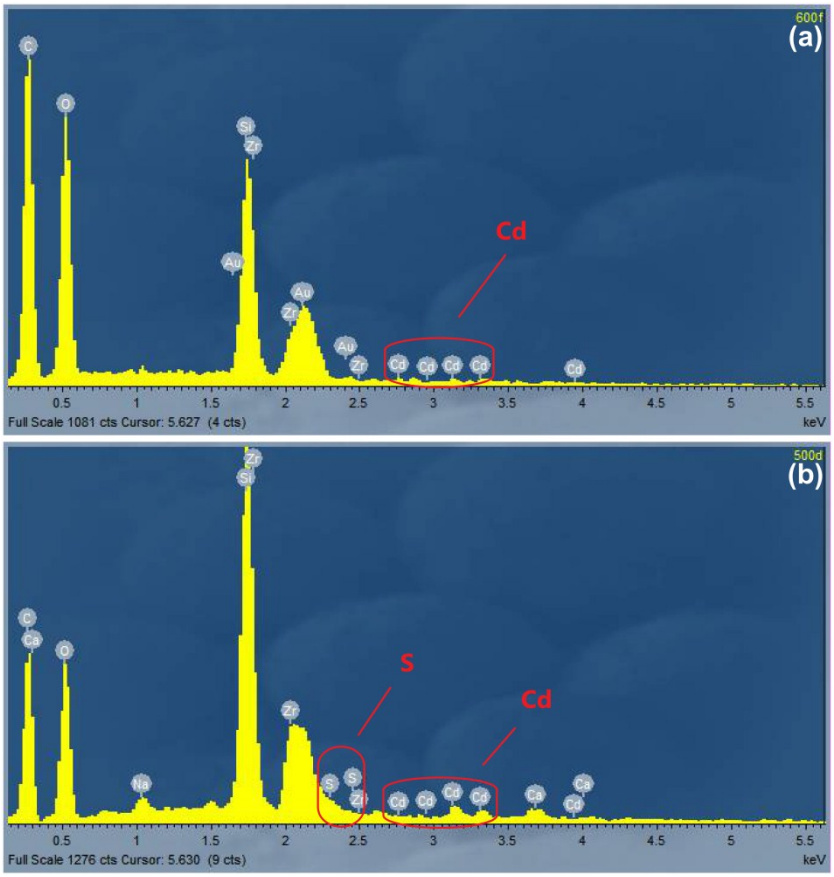

Fig. S2 EDS measurements for a woodpile photonic crystal **a)** before and **b)** after in situ synthesis of CdS quantum dots.

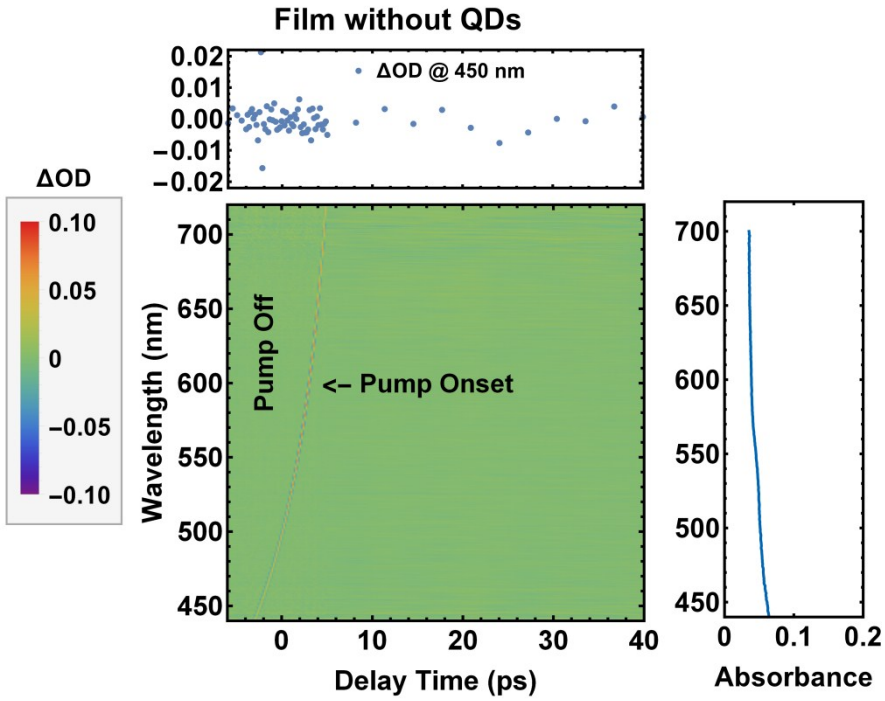

Fig. S3 Pump-probe measurements on a pure polymer film of the composite material. Incident pump fluence ~ 17.5 mJ/cm^2. Main panel: Spectrogram of the changes in Optical Density (ΔOD) of transient absorption as a function of wavelength and pump-probe delay time. Left panel: Color-scale representing the range of ΔOD values. Upper panel: A temporal cross-section of $\Delta OD(\Delta t)$ at the wavelength of 450 nm. Right panel: UV-Vis absorption spectrum (also shown in Fig. 2) of the pure polymer film.

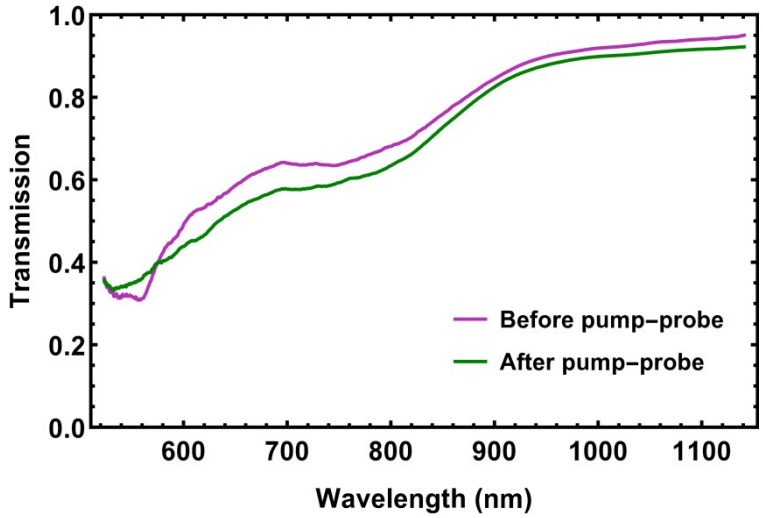

Fig. S4 FTIR transmission measurements for a woodpile structure with 600 nm inlayer periodicity functionalized with CdS quantum dots: before (purple) and after (green) high pump excitation (incident pump fluence ~ 11 mJ/cm^2).

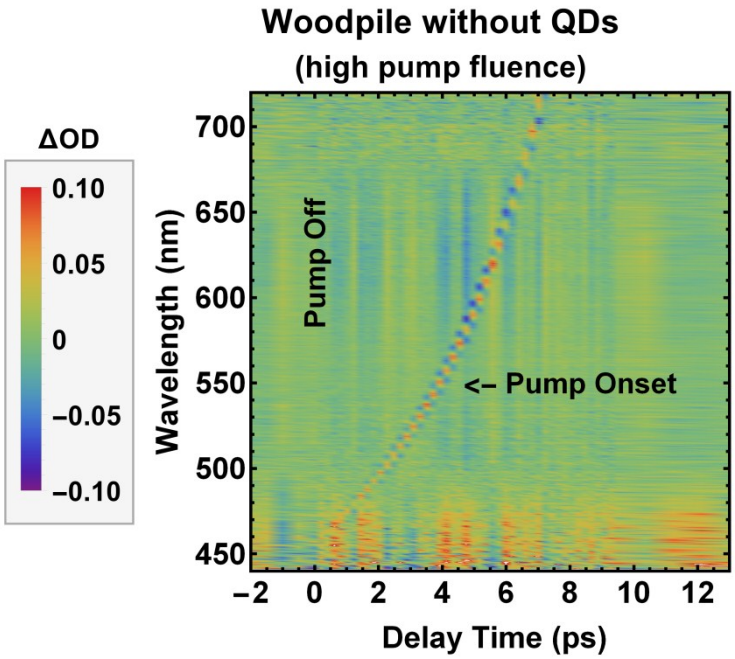

Fig. S5 Pump-probe measurements on a woodpile structure with 600 nm inlayer periodicity prior to in situ synthesis of CdS quantum dots (QDs). Incident pump fluence ~ 18.1 mJ/cm^2. Main panel: Spectrogram of the changes in Optical Density (*ΔOD*) of transient absorption as a function of wavelength and pump-probe delay time. Left panel: Color-scale representing the range of *ΔOD* values.

References:

S1 M. N. Kalasad, M. K. Rabinal, B. G. Mulimani, and G. S. Avadhani, *Semicond. Sci. Technol.*, 2008, **23**, 045009.