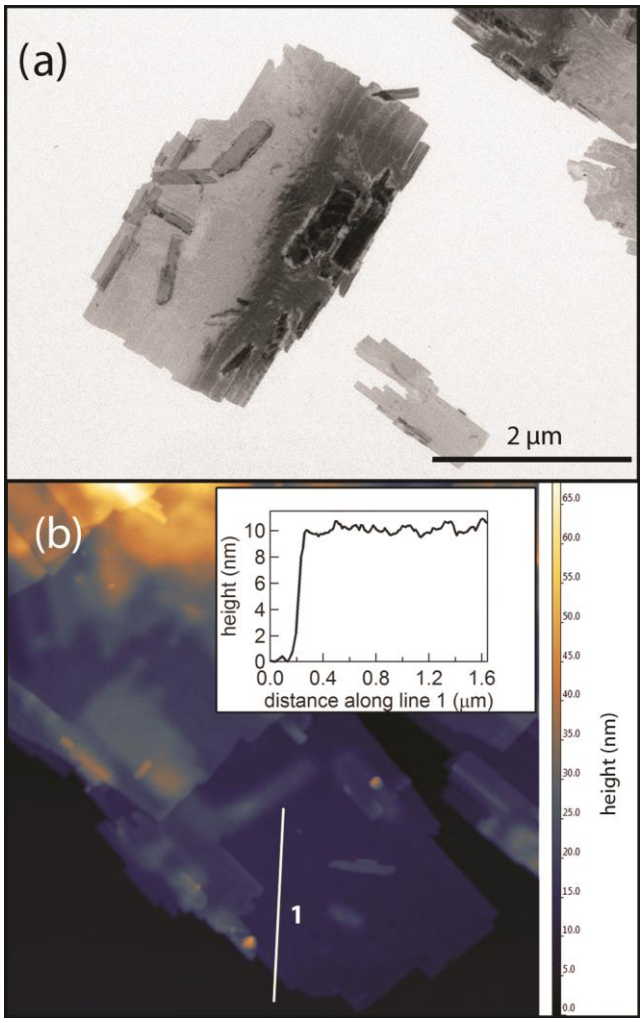
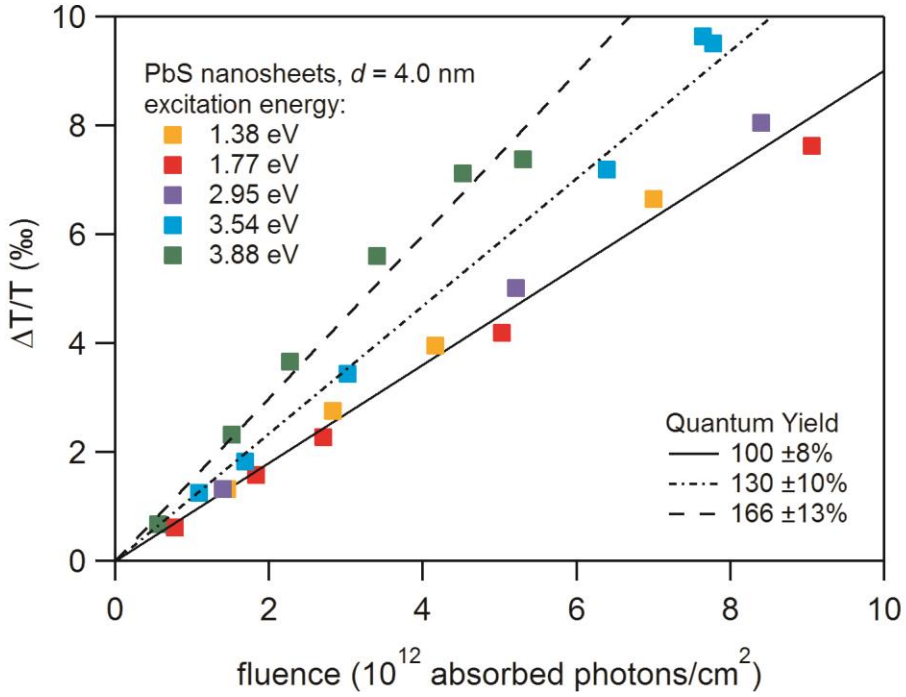
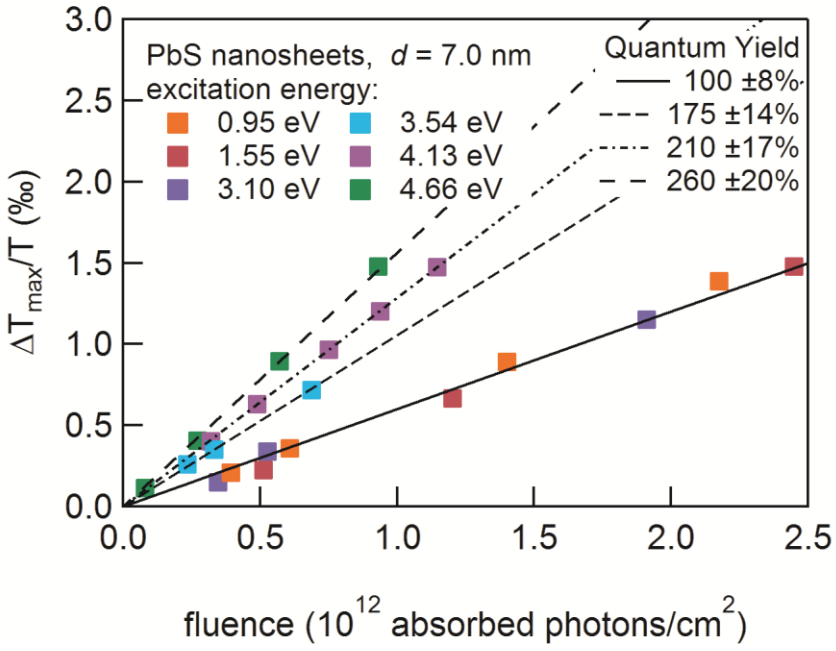



**Supplementary Figure 1:** a) TEM image of a representative PbS nanosheet, with smaller nanosheets stacked upon it. b) AFM image of PbS nanosheets. The inset shows a height profile scan along line 1, corresponding with a total thickness of 9.5 nm. The double oleic acid ligand layer has a total thickness of 3.5 nm, and consequently the thickness of the nanosheet is 6.0 nm.




**Supplementary Figure 2:** $\Delta T_{max}/T$ versus the number of absorbed photons per unit area at various photon energies for the PbS sheets with $d = 4.0$ nm. The solid and dashed lines are linear fits to the data. The slope of the lines is equal to $(\Delta T_{max}/T)/(I_0 F_A) = \Phi\sigma$, with $\Phi$ the quantum yield given in the legend at the lower right in the graph.




**Supplementary Figure 3:** $\Delta T_{max}/T$ versus the number of absorbed photons per unit area at various photon energies for the PbS sheets with $d$ = 7.0 nm. The solid and dashed lines are linear fits to the data. The slope of the lines is equal to $(\Delta T_{max}/T)/(I_0 F_A) = \Phi\sigma$, with $\Phi$ the quantum yield given in the legend at the upper right in the graph.