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Ultrasensitive Photodetectors Based on Graphene Quantum Dot-InSe Mixed-Dimensional Van Der Waals Heterostructures

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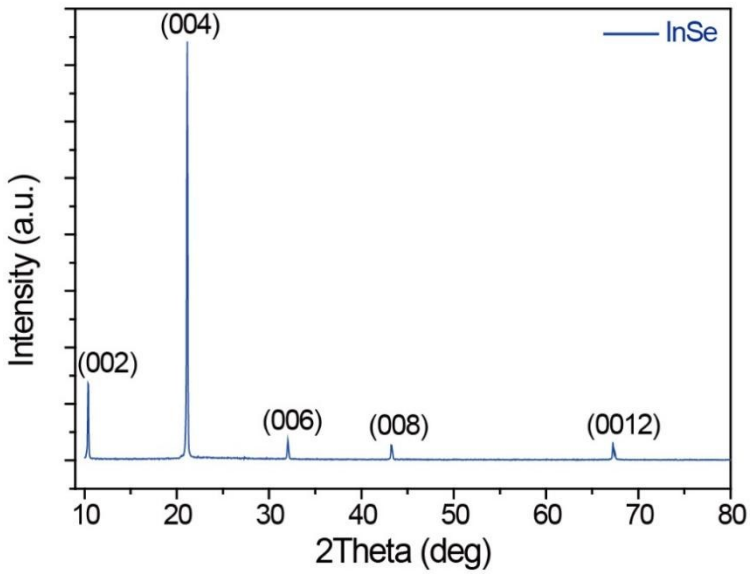

Figure S1. X-ray diffraction of InSe nanosheets.

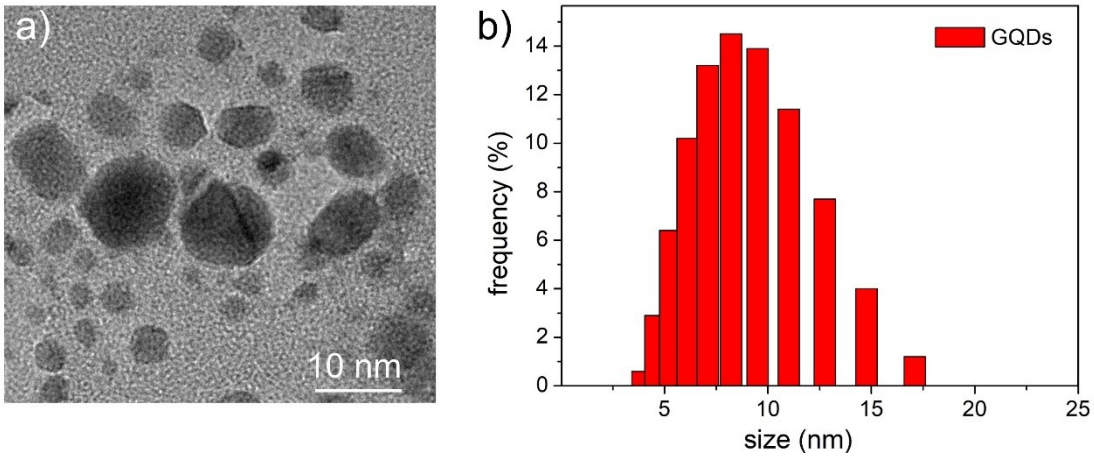

Figure S2. **(a)** Low-resolution TEM (LRTEM) photograph of graphene quantum dots (GQDs). **(b)** The size distribution of GQDs.

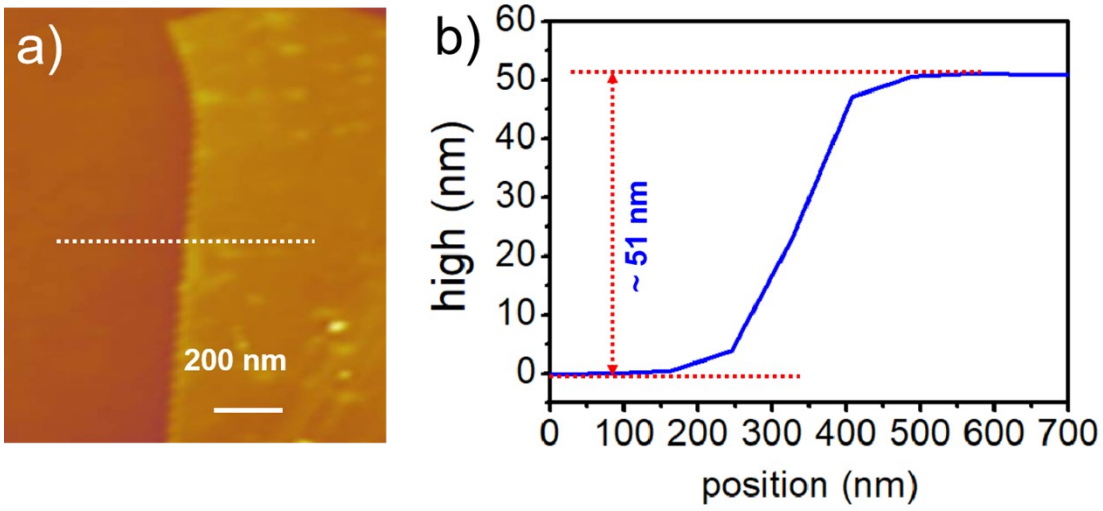

Figure S3. The thickness of InSe sheet measured by atomic force microscopy (AFM).

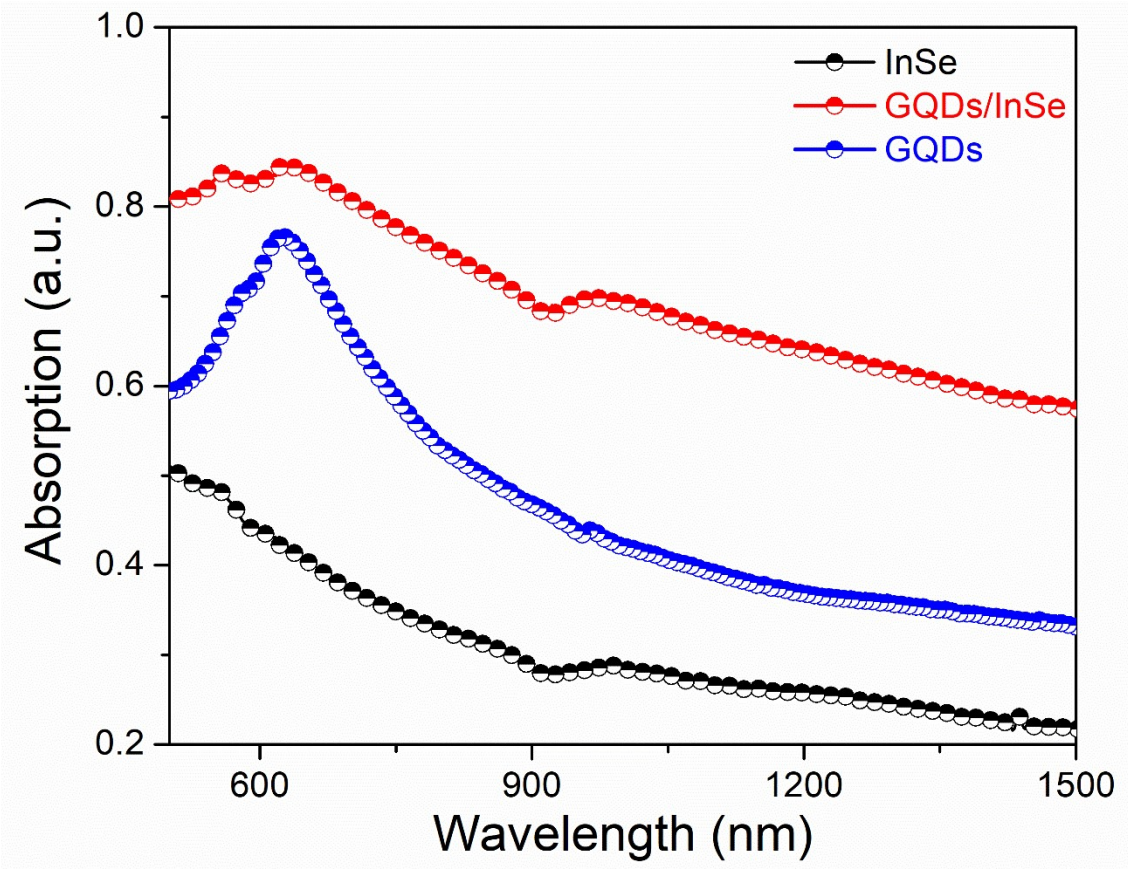

Figure S4. Ultraviolet/vis/near-infrared absorption spectra of pure InSe, pure graphene quantum dots (GQDs), and GQDs/InSe mixed-dimensional van der Waals heterostructures.

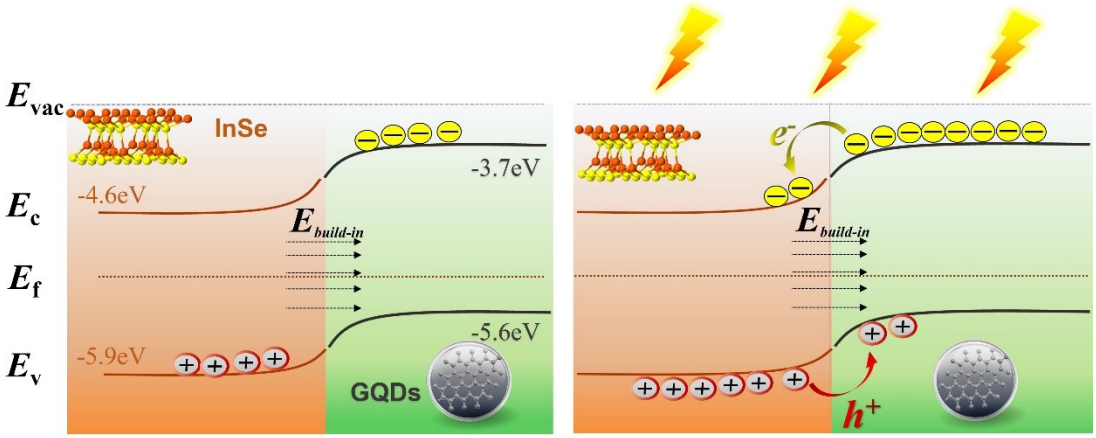

Figure S5. Schematic energy diagram of the GQDs/InSe MvdWHs without (lift) and with (right) light illumination.

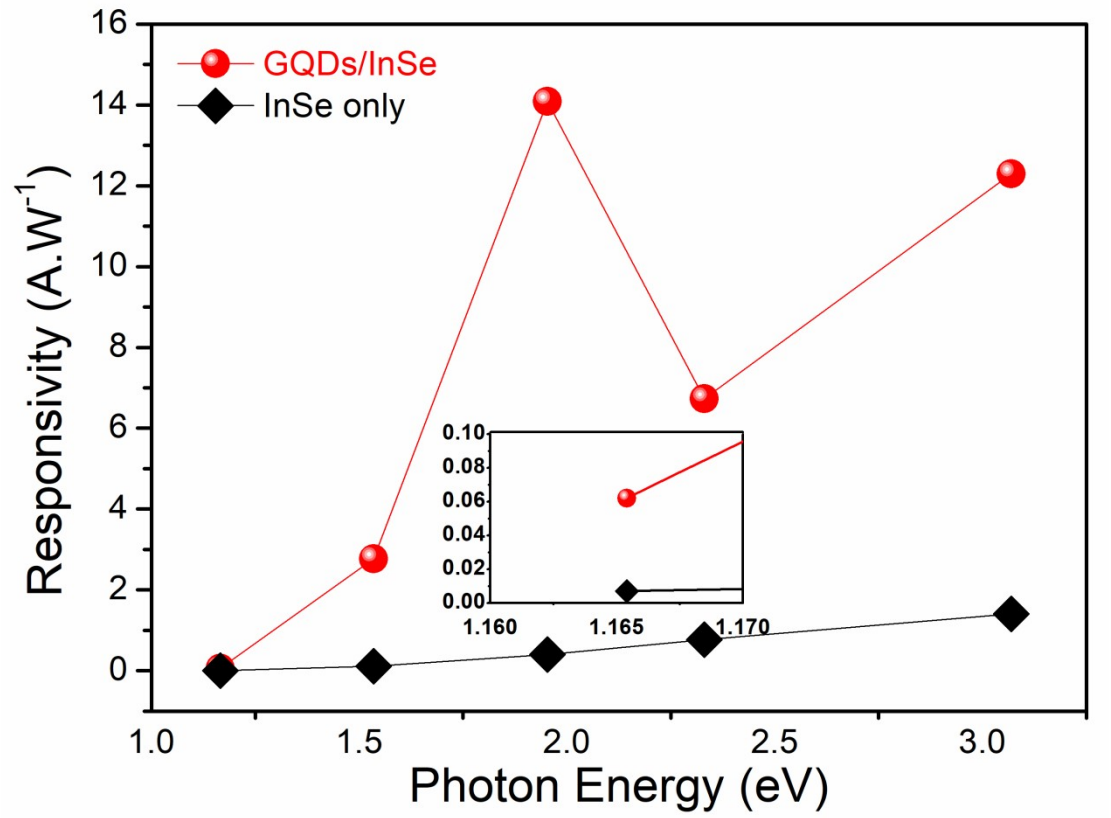

Figure S6. Photon-energy-dependent responsivity of GQDs/InSe MvdWHs and pure InSe photodetectors.

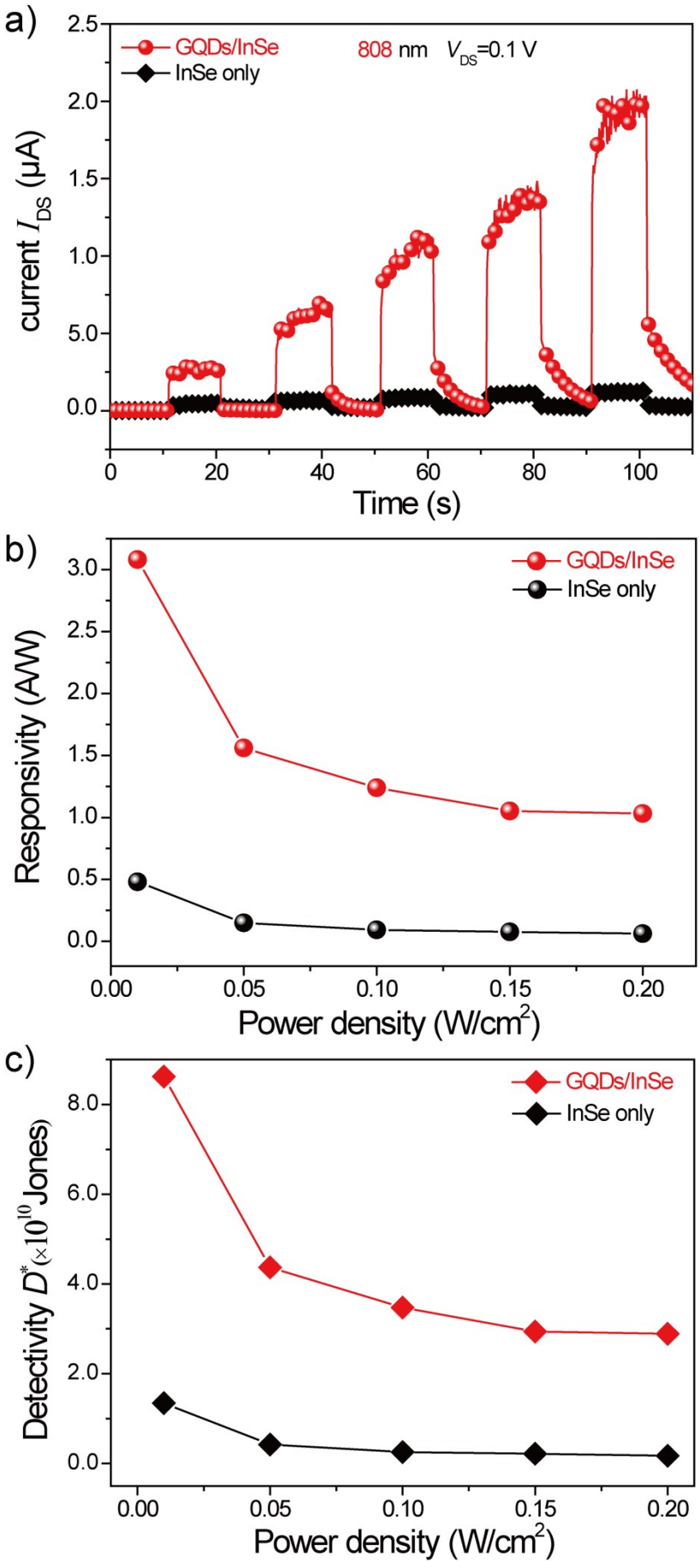
a)
GQDs/InSe
InSe only
808 nm V_{DS}=0.1 V
current I_{DS} (μA)
Time (s)
b)
GQDs/InSe
InSe only
Responsivity (A/W)
Power density (W/cm^2)
c)
GQDs/InSe
InSe only
Detectivity D^* ($\times 10^{10}$ Jones)
Power density (W/cm^2)

Figure S7. **(a)** Current-time response for pure InSe and GQDs/InSe MvdWHs under different incident power density (0.01 to 0.20 W/cm^2). **(b)** Responsivity and **(c)** detectivity of the two devices under different incident laser power density.