Supporting Information

Synthesis of CdSe/Graphene Hybrid Composed of CdSe Quantum Dot Arrays Directly Grown on CVD-Graphene and its Ultrafast Carrier Dynamics

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TEM image of a mesoporous silica thin film

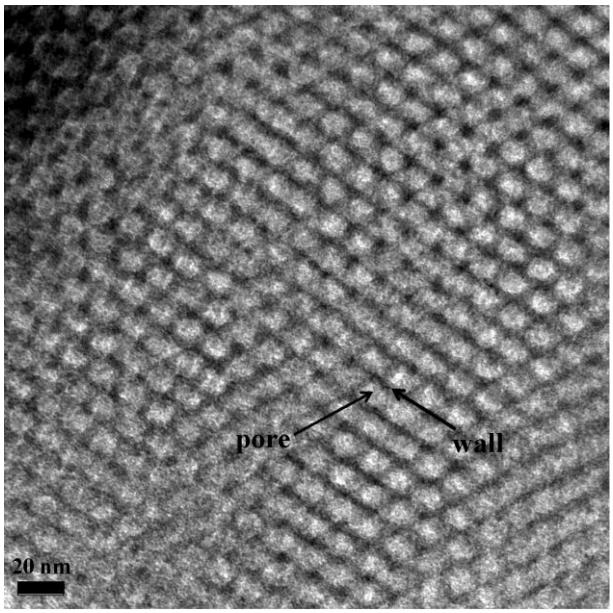

Figure S1. Top-view TEM image of MSTF. MSTF is composed of ordered 8 nm sized pores in the hexagonal symmetry.

AFM images of CdSe QD/G

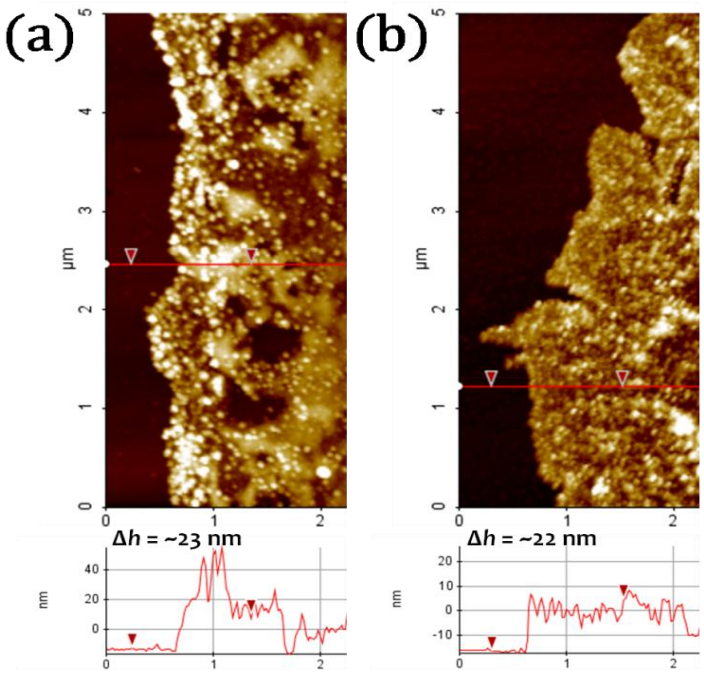

Figure S2. AFM images of T-QD/G samples. Based on the readings of the AFM plots, the samples in (a) and (b) have the same height of ~20 nm. The samples in (a) and (b) has been prepared separately, but with the same amount of deposition time.

Fluorescence life-time measurement data

Table S1. Emission decay of CdSe QDs. (excitation at 485 nm diode laser, detection at 640 nm)

	α_1	τ_1(ns)	α_2	τ_2(ns)	α_3	τ_3(ns)	$<\tau>$(ns)
D-QD/Quartz	0.52	0.537	0.38	2.51	0.1	11.5	6.62
D-QD/G	0.75	0.176	0.21	0.98	0.04	4.67	2.09

These values were used to estimate the average lifetime of CdSe emission decay using the expression.[1]

$$<\tau> = \alpha_1\tau_1^2 + \alpha_2\tau_2^2 + \alpha_3\tau_3^2 / \alpha_1\tau_1 + \alpha_2\tau_2 + \alpha_3\tau_3$$

Raman spectra of three-layer graphene (3LG) and CdSe QD/3LG

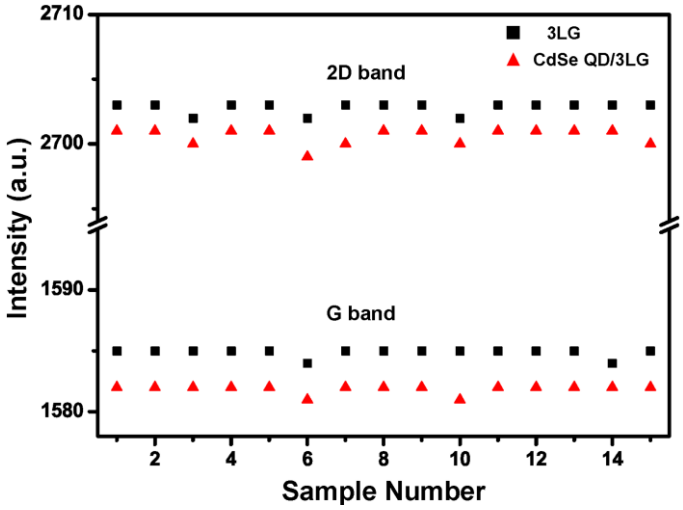

Figure S3. G peak and 2D peak positions before and after the deposition of CdSe QDs on tri-layer graphene.

Current-voltage characteristics of the CdSe QDs on graphene

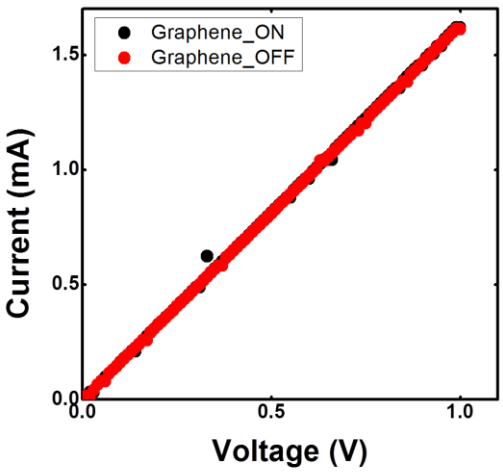

Figure S4. Current-voltage characteristics of a device made of intrinsic graphene without CdSe QDs

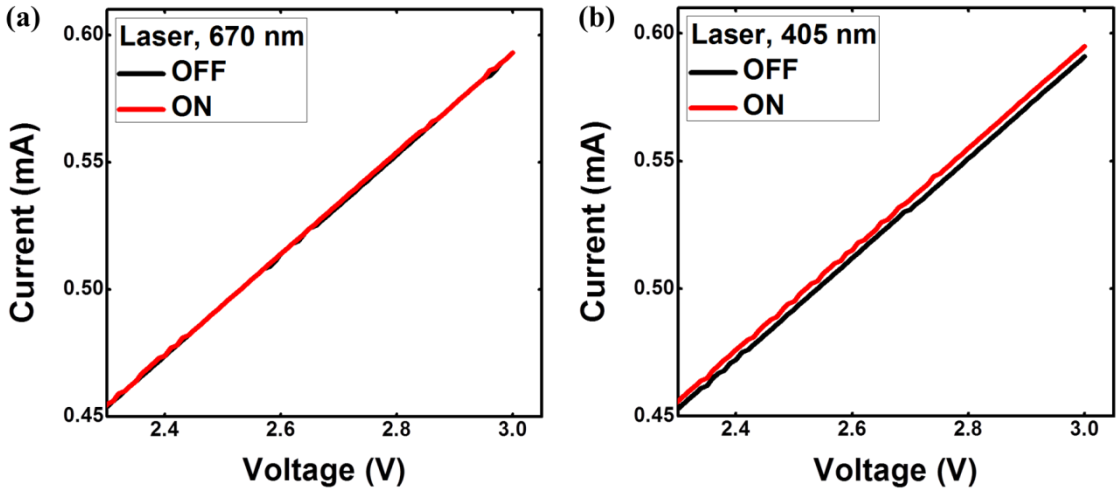

Figure S5. Current-voltage characteristics of T-QD/3LG with and without irradiation of laser with different wavelengths: (a) 670 nm; (b) 405 nm. Light source used LDH-P-C-405B (power: 1 mW) for 405 nm and LDH-P-670 (power: 0.3 mW) for 670 nm.

Photographs of CdSe QDs/graphene on a PET film

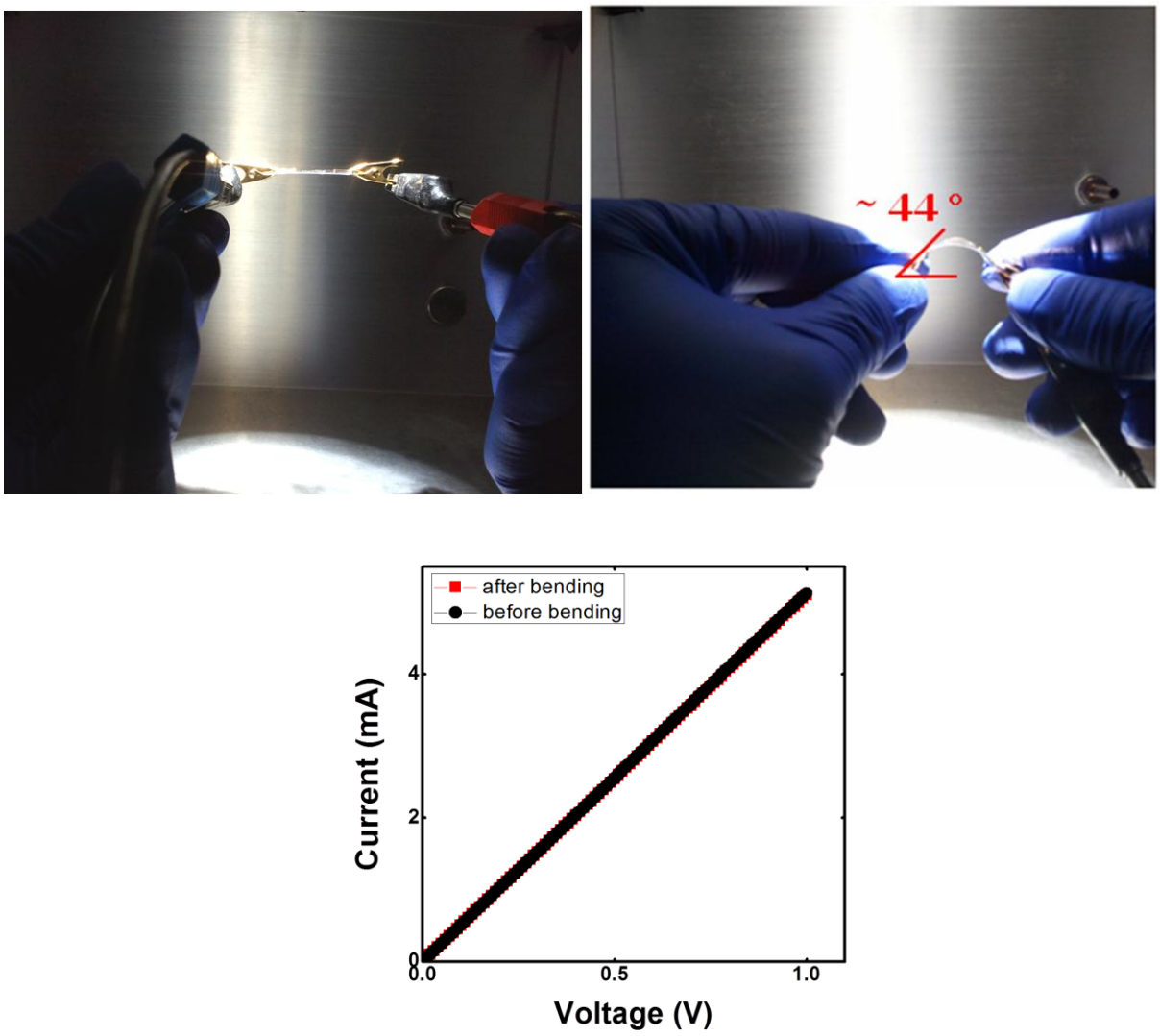

Figure S6. Photographs and current-voltage characteristics of the CdSe QD/G on a PET film with and without bending under visible illumination.

References

1. Farrow, B.; Kamat, P. V. *J. Am. Chem. Soc.*, **2009**, *131*, 11124–11131.