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Self-assembled graphene/BUBD-1 hybrids for ultrasensitive organic phototransistors

Shuchao Qin,*[a] Xue Qin,[a] Qianqian Du,[a] Yuquan Gan,[a] Yuting Zhang,[a] Anran Wang,[b] Xunling Yan,[a] Ruixin Dong,[a] Yunlong Liu,[a] Shuhong Li,[a] Cailong Liu,[a] Wenjun Wang,*[a] and Fengqiu Wang*[b]

[a] Key Laboratory of Optical Communication Science and Technology of Shandong Province, School of Physical Science and Information Engineering, Liaocheng University, Liaocheng 252059, China

[b] School of Electronic Science and Engineering and Key Laboratory of Intelligent Optical Sensing and Manipulation, Ministry of Education, Nanjing University, Nanjing 210093, China

Corresponding Authors:

*E-mail: Shuchao Qin (lcqinshuchao@126.com); Qianqian Du (dzdq0126@163.com)

Wenjun Wang (phywwang@163.com); Fengqiu Wang (fwang@nju.edu.cn).

S1. AFM image of BUBD-1 on SiO_2/Si

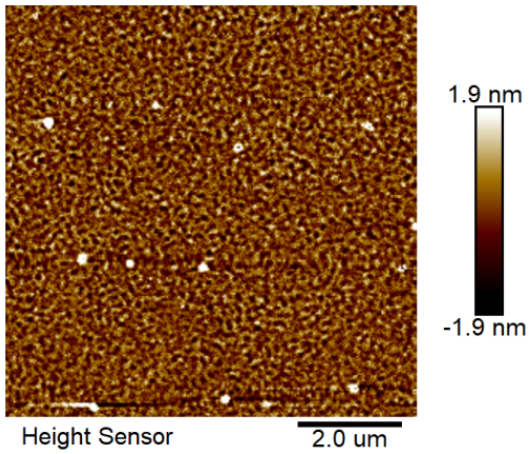

Figure S1. AFM image of BUBD-1 on SiO_2/Si substrate.

S2. PL of BUBD-1 on different substrates

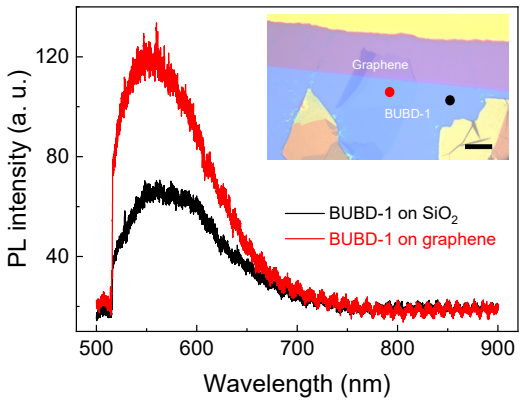

Figure S2. Photoluminescence spectra of BUBD-1 (~30 nm) measured at two locations, on graphene (red point, as optical microscopy image in inset) and on SiO_2 substrate (black point). Scale bar, 20 μm. The PL from BUBD-1 on graphene is much stronger, indicating a better crystalline structure.

S3. Transfer curves and shifts of Dirac point

Figure S3a shows the resistance of hybrid device as a function of gate voltage under illumination (405 nm). For this device, illumination causes the Dirac point to shift to

higher values of V_G, indicating that photogenerated holes in BUBD-1 are transferred into graphene. Figure S3b summarized the shifts of V_D as a function of power density.

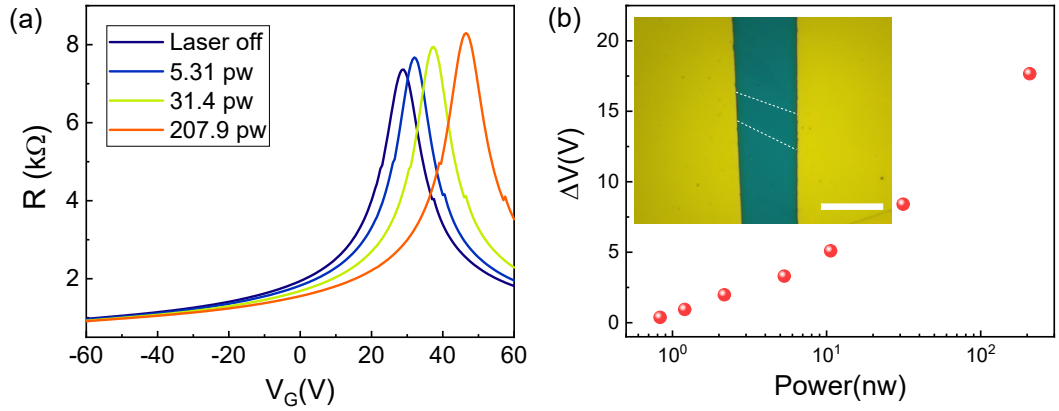

Figure S3. (a) Resistance as a function of gate voltage for the graphene/BUBD-1 phototransistor under various optical powers (405 nm laser). (b) Illumination-dependent shift of V_D. Inset shows the optical image of graphene/BUBD-1 hybrid device. Scale bars: 20 μm.

S4. Effect of the gate voltage on photoresponsivity

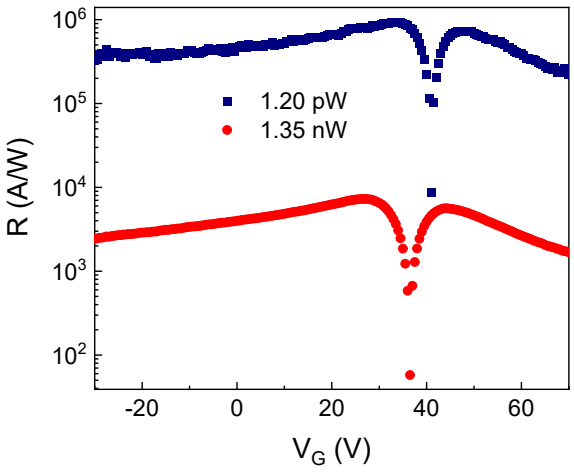

Figure S4. Photoresponsivities as a function of gate voltage under different power (405 nm laser).

S5. Schematic diagram of test temporal responses setup

Figure S5. The schematic diagram of test circuit setup employing a high frequency oscilloscope.

S6. EQE of the hybrid device for different irradiation

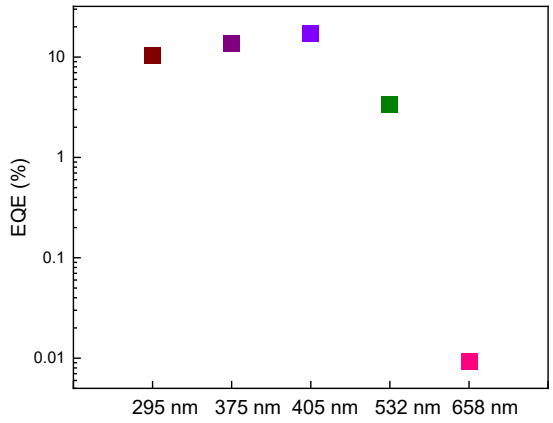

Figure S6. EQE of the device for different photon irradiation (~ 1 nW).

S7. AFM images of BUBD-1 on CVD graphene

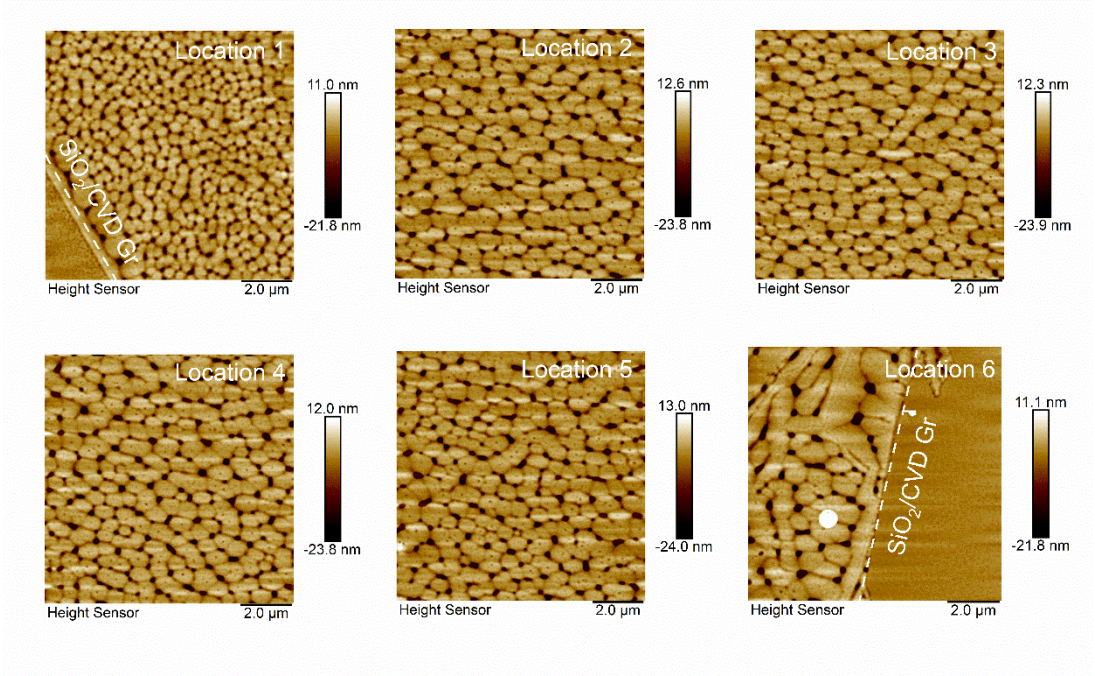

Figure S7. AFM images of BUBD-1 on CVD graphene measured random six positions.

S8. Photoresponse of CVD graphene/BUBD-1 device

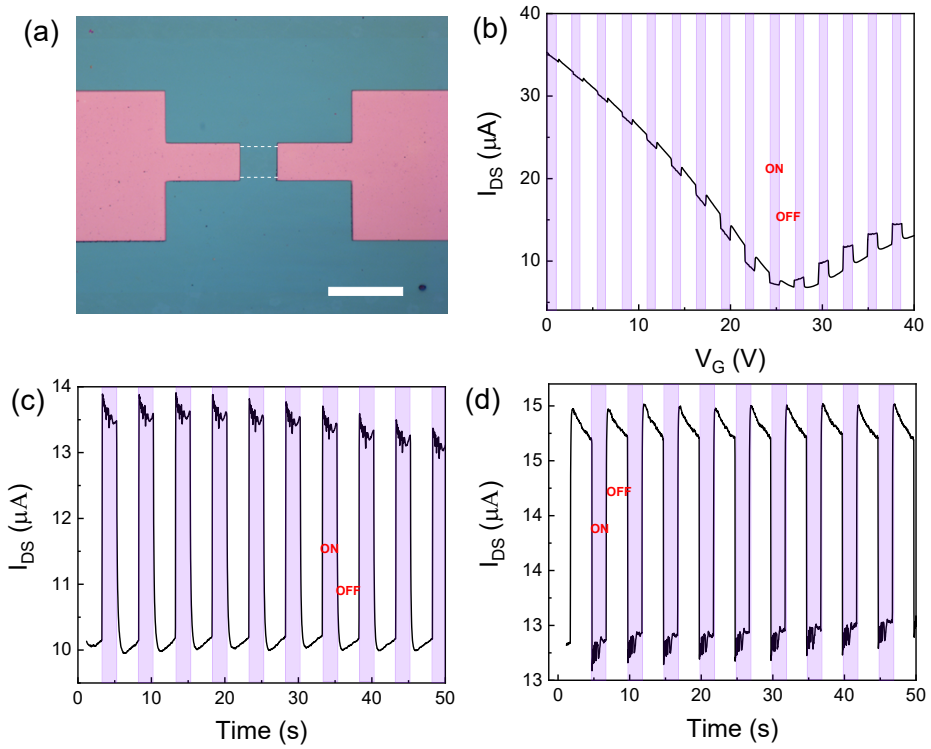

Figure S8. Optical microscopy image of the CVD graphene/BUBD-1. (b) Transfer characteristics of the device under dark and illumination. (c) The photocurrent response of the device at V_G=20 V. (c) The photocurrent response of the device at V_G=30 V.