

Article

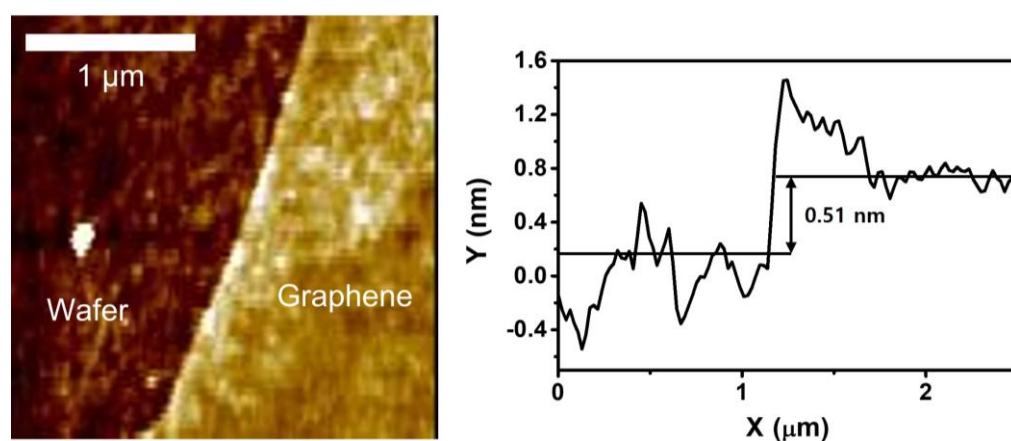
# Photogating effect of atomically thin graphene/MoS<sub>2</sub>/MoTe<sub>2</sub> van der Waals heterostructures

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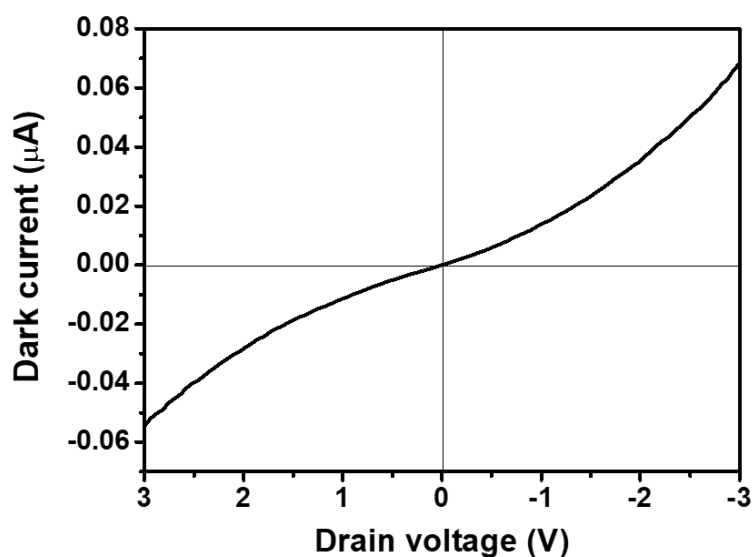
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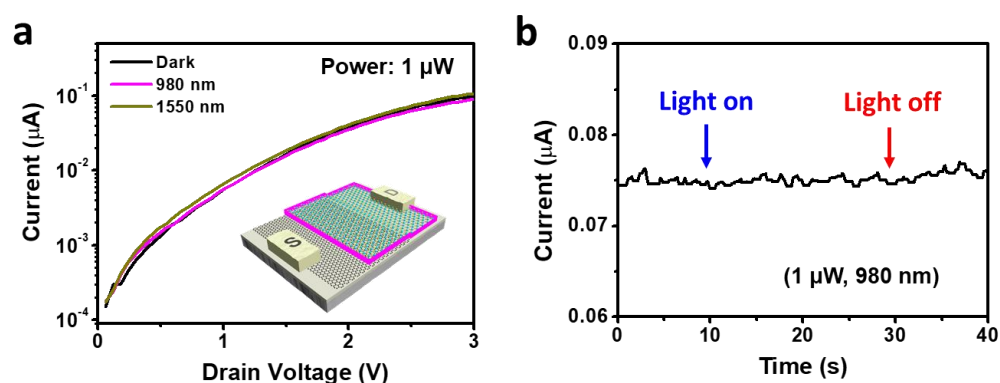
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**Figure S1.** AFM image (left) and corresponding cross-sectional height profile (right) of graphene used in the photodetector.



**Figure S2.** Dark current-voltage characteristics of the photodetector.



**Figure S3.** **a**, Current–voltage curves of graphene/MoS<sub>2</sub> photodetector without MoTe<sub>2</sub> layer under illumination with 1-μW laser and **b**, time-resolved photocurrent of device under illumination with 1-μW laser at 980 nm.

**Table S1.** Comparison of the performance parameters for photodetectors.

| Material   | Responsivity (R)<br>[A/W]/<br>Wavelength [nm] | Detectivity(D*)<br>[Jones] | Response time<br>[ms]          | Ref.      |
|--|---|----------------------------|--------------------------------|-----------|
| MoTe <sub>2</sub> /MoS <sub>2</sub> /<br>Graphene          | 1.8×10 <sup>2</sup> / 1550                    | 5×10 <sup>9</sup>          | 370                            | This work |
| Gra-<br>phene/MoTe/Gra<br>phene                            | 0.11 / 1064                                   | -                          | 0.024                          | [22]      |
| MoTe <sub>2</sub> /graphene                                | 970.82 / 1064                                 | 1.55×10 <sup>11</sup>      | 78                             | [15]      |
| Bilayer MoS <sub>2</sub>                                   | 5.2 / 1070                                    | -                          | 44500                          | [44]      |
| MoSe <sub>2</sub> /Si                                      | 0.522 / 1100                                  | 6.7×10 <sup>9</sup>        | 18×10 <sup>-6</sup> (@1550 nm) | [45]      |
| Gra-<br>phene/Ta <sub>2</sub> O <sub>5</sub> /Gra<br>phene | 4 / 1300                                      | -                          | >500                           | [46]      |
| Black phospho-<br>rus                                      | 0.005 / 1550                                  | -                          | -                              | [47]      |
| MoS <sub>2</sub> /black<br>phosphorus                      | 0.0015 / 1550                                 | 2.13×10 <sup>9</sup>       | 0.015                          | [24]      |
| Nitrogen-doped<br>CNT                                      | 0.388 / 1550                                  | -                          | 11000                          | [48]      |
| PtSe <sub>2</sub>  | 0.054 / 8350                                  | 2.5×10 <sup>6</sup>        | -                              | [49]      |