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**Ultrasensitive near-infrared photodetectors based on graphene-$MoTe_2$-graphene vertical van der Waals heterostructure** KUN ZHANG, YU YE, LUN DAI, Peking University, SCHOOL OF PHYSICS, PEKING UNIVERSITY TEAM — Two-dimensional (2D) materials have rapidly established themselves as exceptional building blocks for optoelectronic applications, due to their unique properties and atomically thin nature. Nevertheless, near-infrared (NIR) photodetectors based on layered 2D semiconductors are rarely realized. In this work, we fabricate graphene-$MoTe_2$-graphene vertical vdWs heterostructure by a facile and reliable site controllable transfer method, and apply it for photodetection from visible to the NIR wavelength range. Compared to the 2D semiconductor based photodetectors reported thus far, the graphene-$MoTe_2$-graphene photodetector has superior performance, including high photoresponsivity (110 mA $W^{-1}$ at 1064 nm and 205 mA $W^{-1}$ at 473 nm), high external quantum efficiency (*EQE*, 12.9% at 1064 nm and 53.8% at 473 nm), rapid response and recovery processes (rise time of 24 $\mu$s, fall time of 46 $\mu$s under 1064 nm illumination), and free from an external source-drain power supply. The all-2D-materials heterostructure has promising applications in future novel high responsivity, high speed and flexible NIR devices.

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