Gate Tunable Photoresponse of a Two-Dimensional p-n Junction for High Performance Broadband Photodetector

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Optoelectronic devices based on two-dimensional (2D) van der Waals (vdWs) materials and their heterostructures are promising owing to their intriguing properties [1,2]. However, the achievement of high-performance photodetectors over a wide detection range is still limited. In particular, detection in the near-infrared (NIR) region has not been attained successfully because of the relatively low responsivity to date [3]. Herein, we report an efficient photodetection from visible to NIR ranges using a ReS_2/Te vdWs heterostructure [4]. The dependence of the photocurrent on the incident power reveals that the dominant operating mechanism can be switched between the photogating effect and photoconductive effect by applying the back-gate voltage. The ReS_2/Te photodetector exhibits remarkable responsivities of 3×10^6 A W^{-1} at 458 nm and 1×10^6 A W^{-1} at 1062 nm laser irradiations, and an ultrahigh photoconductive gain (up to 10^8) resulting from the strong photogating effect. These outstanding performances demonstrate that the ReS_2/Te vdWs heterostructure is suitable for high-performance broadband photodetectors in practical applications.

References

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