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Graphene-hBN-Graphene Photodetector with Low Dark Current

RUYUE ZHANG, School of Physics, Nankai University, ZHIBO LIU, Teda Applied Physics Institute, Nankai University — Graphene is a highly promising material for high speed, broadband, and high responsivity photo detection. However, the only 2.3% absorption of incident infrared-to-visible lights in graphene significantly limits their potential for applications. What is more, most of them are based on field effect transistor structures containing mechanically exfoliated graphene with high dark current, not suitable for practical large-scale device applications. We are aimed to study the photo response of pure monolayer graphene prepared by chemical vapor deposition and fabricate high efficient photodetectors by varying its structure. We performed the transfer of CVD-grown graphene by PMMA, studied the dark and photo I-V characteristics and the photosensitivity properties of pure monolayer graphene. A graphene-hBN-graphene structure of photodetector was designed, in which a boron nitride layer was sandwiched between two CVD graphene layers. Low dark current compared with the pure monolayer graphene photodetector was easily obtained for 532 nm incident lights due to the dielectric properties of boron nitride. And because of the low dark current, photocurrents can be easily distinguished from the background. High responsivity was obtained because incident light act on two layers of graphene simultaneously. The new structure graphene photodetector shows a great promise for a wide variety of application fields.

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