

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Vertically Stacked Graphene/Transition-Metal-Dichalcogenides/Graphene Heterojunction Devices for High Performance Photodetectors JINSEONG HEO, HEEJEONG JEONG, JAEHO LEE, KIYOUNG LEE, EUN-KYU LEE, SANGYEOP LEE, YEONCHOO CHO, KYUNGEUN BYUN, CHANG-WON LEE, SEONGJUN PARK, SUNGWOON HWANG, Samsung Advanced Institute of Technology — Photodetectors based on vertically stacked graphene heterojunctions have advantages of short transit length for photo-generated carriers and large sensing area, thus implying fast response time and high responsivity. Previously, vertically stacked Graphene (Gr)/Transition-Metal-Dichalcogenide (TMDC)/Gr junctions were introduced for optoelectronic devices, showing high current on and off ratio as well as photoresponsivity. But for high performance photodetectors, both thorough and comparative study in terms of the figures of merit such as photoresponse time and photoresponsivity depending on different TMDC materials is crucial. Here, we report fast response time (28 us) and high responsivity (20 A/W) from Gr/WSe₂ and MoS₂/Gr, respectively. At the same time, those devices operate as p- and n-type barrier-variable transistors, respectively, being a potential building block for optoelectronic system on a chip.

Jinseong Heo
Samsung Advanced Institute of Technology

Date submitted: 04 Nov 2015

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