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Facile Fabrication of Graphene/MoS_2 Heterostructure Devices on Arbitrary Substrates by Photolithography.[1] PEIZE HAN, Department of Physics, Georgetown University, YIJING LIU, School of Physics, Nankai University, Tianjin, 300071, China, QING WANG, Department of Physics and Nanoscience Technology Center, University of Central Florida, NICHOLAS QUIRK, ABDEL EL FATIMY, Georgetown University, MASAHIRO ISHIGAMI, Department of Physics and Nanoscience Technology Center, University of Central Florida, PAOLA BARBARA, Department of Physics, Georgetown University — Atomically thin materials like graphene and transition metal dichalcogenides are ideal candidates to create ultra-thin electronics that is suitable for flexible substrates. However, high-yield and mass production of these heterostructures is a challenge. We developed a process to fabricate devices based on heterostructures of two-dimensional materials grown by CVD, using standard photolithography. We showed that the transfer and patterning processes do not degrade the structural integrity and the optical properties of the two-dimensional materials. Devices fabricated from CVD-grown graphene and MoS_2 yield photoresponsivity higher than 800 AW^{-1} to 633nm laser, with no gate applied. This excellent performance is comparable or above photodetectors made with exfoliated flakes and electron-beam lithography, making this method very promising for large-scale optoelectronics applications.

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