

Abstract Submitted
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Synthesis and Photoresponse of the Graphene-MoS₂ in-plane Heterostructures¹ XI LING, YUXUAN LIN, QIONG MA, JING KONG, MILDRED DRESSELHAUS, MIT — The heterostructures of two-dimensional materials offer a possibility to create high performance electronic and optoelectronic devices. Here, we present the construction of both the stacked and in-plane Graphene-MoS₂ heterostructures directly during CVD growth. Exfoliated or patterned CVD-grown graphene were prepared on the 300 nm SiO₂/Si substrate in advance. Using the seed-assisted method, different kinds of seeds were chosen to synthesize the stacked or in-plane Graphene-MoS₂ heterostructures. Using the F16CuPc molecule as a seed, which can stick on the graphene surface under the growth temperature, the MoS₂ monolayer was obtained on top of the graphene to achieve the construction of a stacked Graphene-MoS₂ heterostructure. For an in-plane Graphene-MoS₂ heterostructure, which can only be constructed by direct growth, we use the PTAS promoter as a seed, which prefers to stay on the SiO₂/Si substrate out of the graphene. Then, the MoS₂ monolayer was grown out from the edge of graphene to obtain the in-plane Graphene-MoS₂ heterostructure, which was confirmed by AFM, Raman, PL and electric measurements. Furthermore, the photocurrent from the in-plane Graphene-MoS₂ junction was measured and a high performance photoresponse device was achieved.

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