

# **Low-temperature Photothermal Reaction Synthesis of Vertically Integrated Two-dimensional Heterostructure**

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Vertically Stacking of 2D materials is an essential strategy to fabricate heterostructure based functional electronics devices. Because heterogeneous structures not only overcome the inherent limitations of each material but also allow the realization of new physical properties through appropriate combinations. However, the widely used CVD process requires high synthesis temperature(>700°C) that causes thermal damage to surrounding materials, resulting in poorer-than expected functionality. And Herein, we propose a laser-based photothermal synthesis method to fabricate 2D heterostructure. This method enables a low-temperature process and can make a heterostructure efficiently. As a result, the demonstrated graphene/MoS<sub>2</sub> based photodiode showed excellent response/recovery time performance. We anticipate that these layer-selective photothermal processing methods will be utilized as a new approach to realize better nanomaterial based heterojunctions.