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# Detailed optical properties of monolayer MoS2 synthesized on H-BN

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Monolayer $MoS_2$ with fascinating mechanical, electrical and optical properties has generated enormous scientific curiosity and industrial interest. Hexagonal boron nitride (h-BN), an insulating isomorph of graphene with boron and nitrogen atoms occupying the two nonequivalent sub-lattices is relatively inert and expected to be free of charged surface states and dangling bonds. Moreover, h-BN possesses a smaller lattice mismatch (1.4%) with $MoS_2$. Therefore, using h-BN as substrate may provide a possibility of investigating intrinsic properties of monolayer $MoS_2$. In this work, we have devised and realized a high-yield and convenient method to synthesize monolayer $MoS_2$ directly on h-BN flakes via a dual-temperature-zone atmospheric-pressure Chemical Vapor Deposition (CVD) method. Compared with that grown on $SiO_2$/Si substrate, the monolayer $MoS_2$ grown on h-BN exhibits enhanced photoluminescence (PL) and Raman signals as well as the smaller intensity ratio of $E_{2g}$ to $A_{1g}$. Besides, its $A_{1g}$ Raman mode exhibits clear stiffening, whereas its $E_{2g}$ mode exhibits a negligible shift. We have calculated the PL intensity as function of both the h-BN thickness and the PL wavelength based on light ray propagation in multilayer structure. The theoretical analysis and experimental results suggest that the improved optical property of monolayer $MoS_2$ on h-BN results mainly from the weaker doping effect from the h-BN substrate, rather than the optical interference effect suggested previously.

## Biography

Lun Dai has completed her PhD at Peking University, China. She is Director at Institute of Condensed Matter and Material Physics, School of Physics. She has published more than 100 SCI papers, which are cited by SCI papers for more than 3500 times.

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