Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Origin of Improved Optical Quality of Monolayer MoS2 Grown on Nitride Substrates YI WAN, HUI ZHANG, YU YE, LUN DAI, Peking Univ, SCHOOL OF PHYSICS, PEKING UNIVERSITY TEAM — Monolayer molybdenum disulphide (MoS2), a 2D semiconductor with remarkable optical and electrical properties, has been in the spotlight recently. In this work, we realize a high-yield, simple method to grow MoS2 on hexagonal boron nitride (h-BN) flakes, which are relatively inert, expected to be free of charged surface states and dangling bonds. We find that the MoS2 on h-BN exhibits enhanced photoluminescence (PL). We draw the conclusion that the enhanced PL intensities originate probably from a weak doping effect from h-BN substrate, rather than the optical interference effect. Moreover, we successfully synthesized MoS2 on gallium nitride (GaN) substrates. The MoS2 grown on GaN shows an obvious PL peak centered around 1.88 eV, indicates that MoS2 grown on GaN suffers scarcely from strain effect which originates from the contraction mismatch during a cooling process from the high growth temperature to room temperature, due to the relatively small discrepancy in the coefficients of thermal expansion between sample and substrate. Polarization-resolved PL spectroscopy shows that MoS2 grown on GaN possess a high degree of circular polarization, even at room temperature.

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Date submitted: 12 Nov 2016 Electronic form version 1.4