

Thermal properties of thin films of MoS₂ and WS₂ produced by liquid exfoliation and vacuum filtration

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Abstract

In this work thin films of MoS₂ and WS₂ on Si/SiO₂ substrates were produced using liquid exfoliation and vacuum filtration. Thermal conductivity and total interface conductance were extracted by refined optothermal Raman method and finite element simulation [1]. To ensure stability and harmlessness of our measurements we carefully analysed main Raman modes dependencies on laser spot size, laser power and temperature. We used statistical approach over a large area of the sample to probe inhomogeneity of the thin film and increase accuracy of the results. This work contributes to a better understanding of thermal properties of thin films produced by liquid exfoliation, which are crucial in thermal management in any thin films devices [2][3].

References

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- [2] Kelly, A. G., Hallam, T., Backes, C., Harvey, A., Esmaily, A. S., Godwin, I., ... & Kinge, S. Science, 356(6333), (2017), 69-73
- [3] Coleman, J. N., Lotya, M., O'Neill, A., Bergin, S. D., King, P. J., Khan, U., ... & Shvets, I. V., Science, 331(6017), (2011), 568-571

Figures

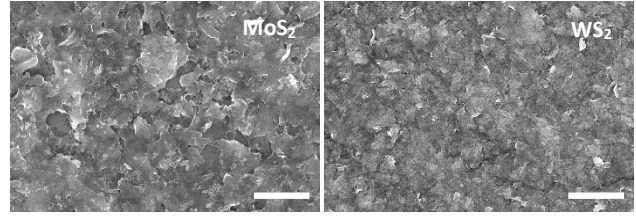


Figure 1: SEM images of MoS₂ and WS₂ thin films. Scale bar is equal to 1 μm.

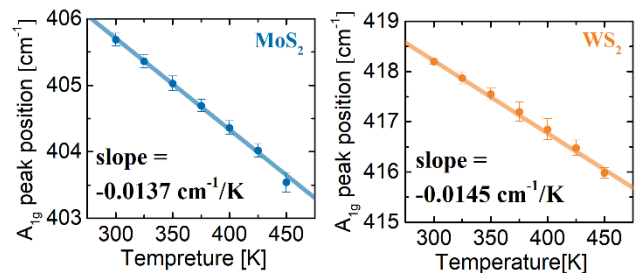


Figure 2: Temperature dependence of A_{1g} band of MoS₂ and WS₂ thin films.

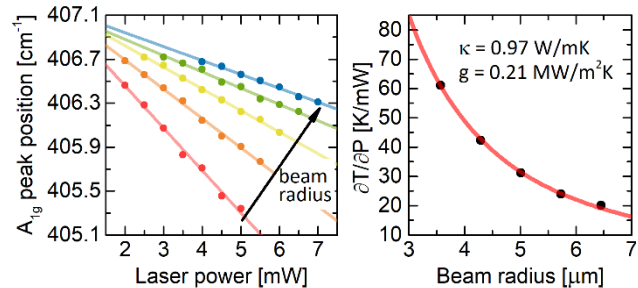


Figure 3: Left: laser power and beam radius dependence of A_{1g} band of MoS₂ thin films. Right: local temperature change on 1mW absorbed laser power vs beam radius with fitted theoretical curve.

Acknowledgments

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