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Raman spectroscopy for measuring thermal properties of thin films and 2D materials

Measuring the thermal properties of thin films and 2D materials is an essential step in correctly assessing the suitability of new materials for many applications. For example, thermal conductivity (κ) and interfacial thermal conductance (g) are crucial in designing optimal heat management in electronic devices.

This short communication presents two Raman-based methods for measuring κ and g in thin films and 2D materials. The first, the opto-thermal Raman method, uses laser light as a heat source and Raman scattered light as a thermometer [1][2]. The second, utilize a transparent electrical heater for a heat source and unique material selectivity of Raman scattered light to directly measure temperature difference in stacked materials.

References

[1] Gertych, A. P., Czerniak-Łosiewicz, K., Łapińska, A., Świniarski, M., Ojrzyńska, M., Judek, J., & Zdrojek, M. (2021). Phonon and Thermal Properties of Thin Films Made from WS_2 Mono-and Few-Layer Flakes. The Journal of Physical Chemistry C, 125(26), 14446-14452

[2] Gertych, A. P., Łapińska, A., Czerniak-Łosiewicz, K., Dużyńska, A., Zdrojek, M., & Judek, J. (2019). Thermal properties of thin films made from MoS_2 nanoflakes and probed via statistical optothermal Raman method. Scientific reports, 9(1), 1-7.

Figures

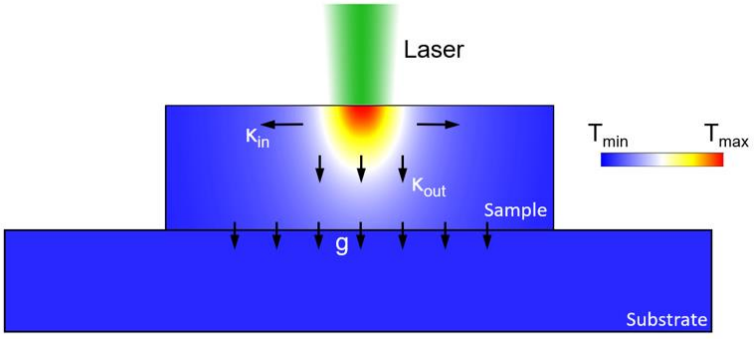

Figure 1: Schematic view of the sample heated by Raman laser.