Kedar Hippalgaonkar
Institute of Materials Research and Engineering, Agency for Science Technology and Research

kedarh@imre.a-star.edu.sg

Thermal and Thermoelectric Physics in 2D MoS_2

2D confinement provides for discretized density of states, which is favorable for thermoelectrics due to an enhanced Seebeck coefficient. Transition Metal Dichalchogenides (TMDCs) provide for effective confinement with very small variation in quantum well thickness. Further, backgating techniques allow for tunability of the carrier concentrations in the conducting channels, which has many advantages compared to traditionally doped bulk materials. In terms of thermal transport, classical size effects can manifest in a reduced phonon mean free path and hence reduce the thermal conductivity. In addition, the interplay between in-plane and cross-plane thermal conductivity can be tuned judiciously for thermal management. In this talk, I will describe our experiments on the Seebeck coefficient in the prototypical TMDC, 2D MoS_2, and discuss our experimental [1] and theoretical results [2] on the effect of dimensional confinement on thermoelectric powerfactor. Additionally, I will discuss the measurement of interface thermal conductance between 2D heterostructures [3] and end with a survey of possible ideas in the field.

References

[1] K. Hippalgaonkar et. al. Phys Rev B, 95 (11), 115407 (2017)
[2] H.K. Ng, D. Chi, K. Hippalgaonkar, Journal of Applied Physics, 121, 204303 (2017)
[3] Liu Yi et. al., Scientic Reports, 7, 43886 (2017)

Figures

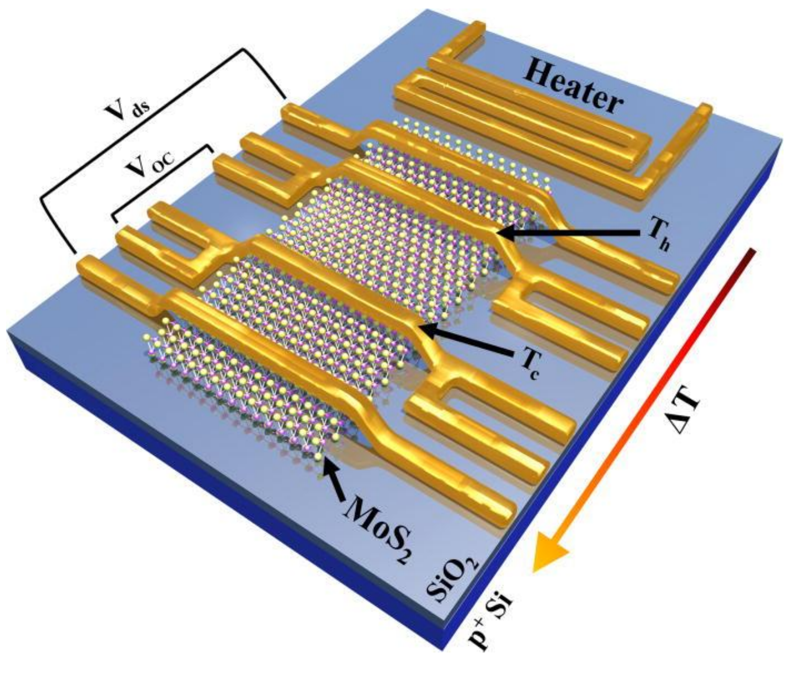

Figure 1: Thermoelectric Measurements of 2D MoS2 with a back gate configuration