Thermoelectric and thermal properties of supported few layers 2D materials

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Abstract

Two-dimensional (2D) materials have a great potential in the domain of energy conversion due to their unique structure and physical properties [1-3]. However, application of 2D materials as thermoelectric materials depends on the ability to fully explore their physical properties once implemented in real devices, requiring heat flow control at the nanoscale. We present here a complete thermoelectric characterization of devices based on thin flakes of tungsten diselenide (WSe2) and multilayer graphene (MLGN) deposited on hexagonal boron nitride (h-BN), by coupling electric and thermoelectric measurements with modulated thermoreflectance (MTR) [4]. Our work demonstrates selective non destructive measurements of thermal conductivities and Seebeck coefficients in 2D materials thin flakes embedded in a device configuration. We provide also evidence that nanostructuring can improve the thermoelectric performances of 2D materials by reducing thermal conductivity and increasing Seebeck coefficient without changing electronic transport.

References

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Figures

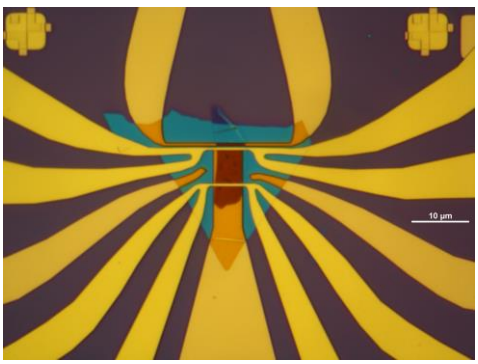

Figure 1: 2D material based device for electric and thermoelectric measurements