Ballistic thermal transport in two-dimensional $MoSe_2$ lattices

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Abstract

Greek letters, sub- and superscripts should be formatted as such. The conduction of heat in two-dimensional lattices features striking phenomena that have attracted considerable interest from a basic science point of view and for technological applications. The thermal conductance of monolayer materials have been extensively studied with Raman and electrical measurements. However, the thermal transport properties of monolayers remain highly debated. Here, I will discuss a new method to study thermal transport in two-dimensions based on opto-mechanical measurements. These measurements are possible because suspended $MoSe_2$ monolayers form mechanical resonators that feature high quality factors and can be probed with low laser power [1]. We measure both the thermal conduction Fig.1 and the heat capacity Fig.2 of suspended $MoSe_2$ monolayers. These measurements reveal ballistic transport of heat when lowering temperature. The new measurement method opens avenues in thermal transport of low-dimensional systems.

References

[1] Nicolas Morell, Antoine Reserbat-Plantey, Ioannis Tsioutsios, Kevin G. Schadler, Francois Dubin, Frank H. L. Koppens, and Adrian Bachtold, NanoLetters 16, 5102-5108 (2016)

Figures

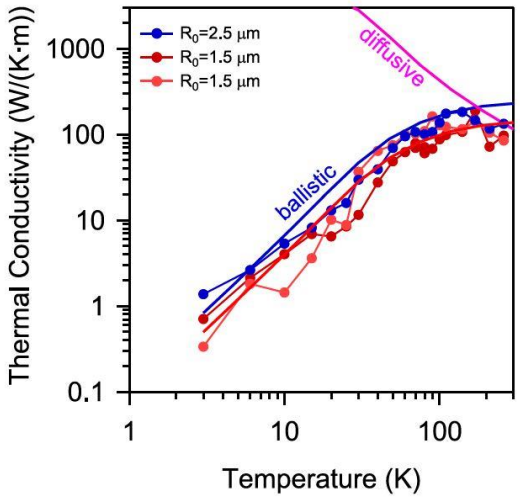

Figure 1: Thermal conductivity versus temperature of Single layer $MoSe_2$

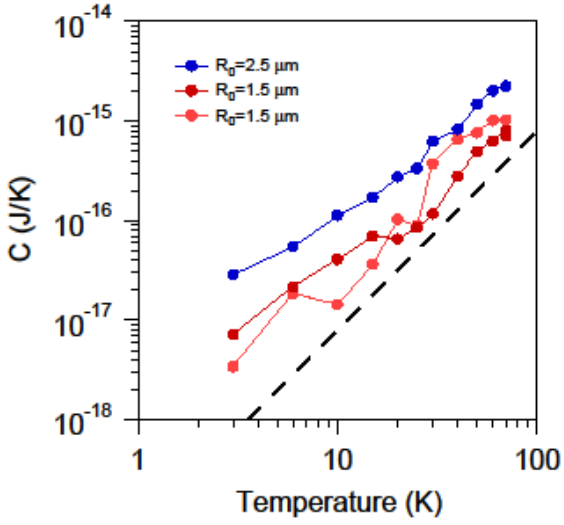

Figure 2: Heat capacity versus temperature of Single layer $MoSe_2$