Preface

A thorough understanding of the thermal properties of materials may enable improved heat management in electronics and could pave the way for efficient energy scavenging from the waste heat in many processes. Conventional investigation of the thermal properties of materials has been focused on the engineering of grain boundaries in polycrystalline bulk samples to improve the thermoelectric materials figure of merit, zT, that is a measure of the efficiency of the thermoelectric conversion and it is a function of the Seebeck coefficient, thermal conductivity, electrical conductivity and temperature. The higher zT values mean higher efficiency in the thermoelectric conversion. An efficient thermoelectric material would ideally have high electrical conductivity and Seebeck coefficient and low thermal conductivity. However, typically these quantities are deeply related to each other. For instance, a material with high thermal conductivity according to the Wiedemann-Franz law has high electrical conductivity as well.

With the advent of the graphene in 2004, materials that are formed by van der Waals stacking of atomically thin two-dimensional (2D) layers have attracted a great deal of interest due to the potential applications in electronics and optoelectronics as various degrees of freedoms such as valley and spin can be tuned via gating and strain engineering. Moreover, via stacking of various layers of different materials, heterostructures with novel functionality can be created. This provides a whole new set of engineering materials in various fields of science and technology.

In this brief, first I will introduce the thermal properties of 2D materials. The focus, however, will be on the thermal conductivity measurement methods commonly used on 2D materials to extract the thermal properties. This brief is intended to be an overview of the available thermal conductivity measurement methods for the atomically thin materials. Due to its brief nature, many technical details will be referenced to the relevant literature. Thus, a certain level of understanding on the

measurement methods is expected from the reader. Finally, a great part of the brief is allocated to the bolometric thermal conductivity measurement method introduced by our group recently. I discuss many points on the measurement technique in great detail in this brief that are not available in any other resources.

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