Thermal Conductivity in Hybrid Graphene-based Quantum Nanoelectronics devices

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Bilayer graphene, known to be a semimetal with remarkable properties designated by very small electronic heat capacitance (high thermal conductivity), is a promising candidate for exploring the effects of the interaction between electronic and lattice contributions to thermal transport. [1][2]

Heat is one main factor that impacts quantum device's performance [3]. Yet, studying the heat flow i.e. electronic heat conductance, is not as direct as measuring the electronic current flow, knowing that the former is not conserved.

In light of this, local and noninvasive electron thermometry is a recently developed method that allows to carry out time-resolved electronic temperature measurements in combination with radio-frequency techniques. [4]

Here, we study the thermal conductivity in gated bilayer-graphene devices encapsulated with hBN. The source contact acts as a calorimeter and local thermometry is performed by a conductance measurement of an SINS junction.

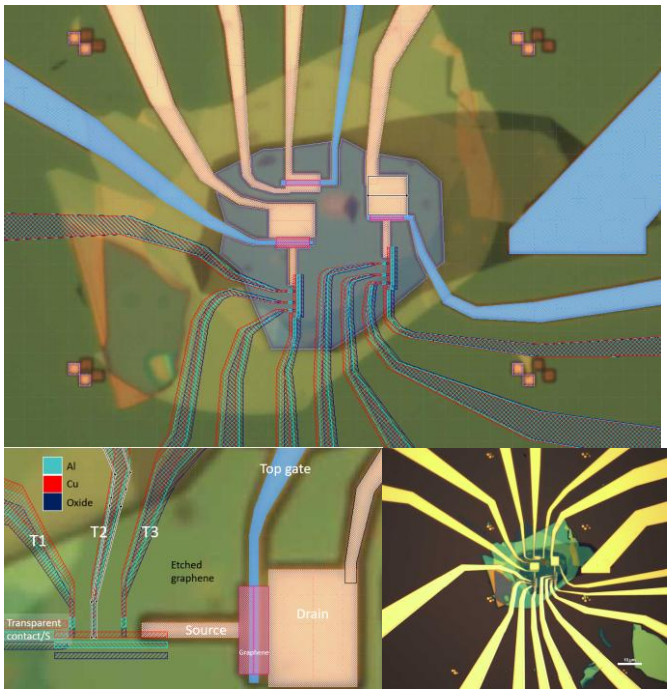

Figure 1: Optical microscopy images of the bilayer graphene-SINS device on a hBN/BG/hBN stack with a graphite back-gate.

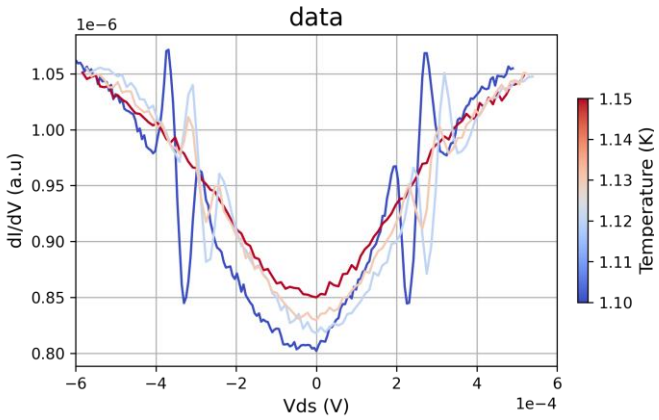

Figure 2: Characterization of the bolometer by measuring the tunnel spectra of an SINS junction at different cryostat temperatures

References
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