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Heat Transport in Graphene SERAP YIGEN, VAHID TAYARI, JOSHUA O. ISLAND, JAMES PORTER, A.R. CHAMPAGNE, Department of Physics, Concordia University, Montreal, QC, Canada — We fabricated suspended graphene devices and measured their thermal conductivity, κ, as a function of both temperature, T, and charge carrier density, n. Heat transport is a powerful tool to obtain information about both the phononic and electronic properties of graphene. Recent heat transport experiments in graphene have shown a high κ, but a detailed mapping of graphene's heat conductivity versus T and n is not yet available. The measurement technique we developed is a two-point method which uses graphene as its own heat source (Joule heating) and thermometer (resistivity). We report κ at temperatures ranging from 6 to 350 Kelvin, and at charge carrier densities close to the Dirac point up to about 1.5 $\times 10^{11}/cm^2$, in graphene crystals whose length varies from 250 nm up to one micron. We observed that the thermal conductivity increases by over two orders of magnitude over the temperature range, and that it also increases with the crystal's length. κ can be tuned by an order of magnitude with gate voltage, opening the possibility of creating room temperature heat transistors.

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