

Abstract Submitted
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Slow imbalance relaxation and thermoelectric transport in graphene IGOR ALEINER, MATTHEW FOSTER, Columbia University — We compute the electronic component (κ) of the thermal conductivity and the thermoelectric power (α) of monolayer graphene, within the hydrodynamic regime, taking into account the slow rate of carrier population imbalance relaxation. Interband electron-hole generation and recombination processes are inefficient due to the non-decaying nature of the relativistic energy spectrum. As a result, a population imbalance of the conduction and valence bands is generically induced upon the application of a thermal gradient. The thermoelectric response of a graphene monolayer depends upon the ratio of the sample length to an intrinsic length scale l_Q , set by the imbalance relaxation rate. At the same time, the metallic contacts required for the thermopower determination (under open circuit boundary conditions) can crucially influence its measurement, since carrier exchange with the contacts also relaxes the imbalance. These effects are especially pronounced for clean graphene, where the thermoelectric transport is limited exclusively by intercarrier collisions. For specimens shorter than l_Q joined to sufficiently resistive contacts, we show that the population imbalance extends throughout the sample; κ and α asymptote toward their zero imbalance relaxation limits. In the opposite limit of a graphene slab longer than l_Q , we show that at non-zero doping κ and α approach intrinsic values characteristic of the infinite imbalance relaxation limit.

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