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Phonon scattering in intrinsic graphene using tight-binding Bloch waves[1] NISHANT SULE, IRENA KNEZEVIC, University of Wisconsin - Madison — The overall interest in graphene as a material for devices has led to tremendous advances in the understanding of transport in graphene. However, there are still questions about the intrinsic limit to electron mobility. Recent experiments have demonstrated mobility greater than 10^7 cm^2/Vs at temperatures close to 50 K, exceeding previous theoretical predictions of the limit for intrinsic mobility. Here, we present a simple model for phonon scattering rates in intrinsic graphene using tight-binding Bloch wave functions for electrons. The tight binding approximation produces an accurate band structure near the Dirac points, as opposed to the nearly free electron model; thus, it is reasonable to assume that the electron wave functions are localized near the atomic centers. These tight-binding Bloch wave functions are calculated by linear combination of the carbon p_z orbitals. We show that the scattering matrix is anisotropic and the small overlap of the Bloch functions results in scattering rates that are lower in comparison to those calculated by assuming plane-wave wave functions. Electron mobility calculated in the relaxation time approximation is compared for scattering rates with Bloch functions and as well as plane waves.

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