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Phonon mediated conductance in misoriented graphene bilayers VASILI PEREBEINOS, JERRY TERSOFF, PHAEDON AVOURIS, IBM - Watson — Electrical transport in a misoriented graphene bilayer is facilitated by umklapp processes whose strength is known to decrease rapidly with the number of atoms in the commensurate cell. As the misorientation angle is reduced, the number of atoms increases, and the umklapp conductance in an ideal (infinitely large and defect free) bilayer becomes negligible. We show that at room temperature coupling to the out-of-plane phonon vibrations leads in a conductance several orders of magnitude larger than that produced by pure electronic umklapp. The most relevant phonons originate from the flexural modes of the monolayer, vibrating out-of-phase in the bilayer, with energies around 80 cm^{-1} near the Γ-point. These phonon modes disperse nearly quadratically away from the center of the Brillouin zone. As the misorientation angle is reduced, the relevant phonon wavevector connecting the two Fermi surfaces in monolayers is reduced as well, which results in larger phonon mediated conductance. This is the opposite behavior to that expected from the umklapp conductance. We will present calculations of phonon mediated conductance as a function of misorientation angle, doping, temperature, and applied bias, for a tight-binding electron-phonon Hamiltonian.

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