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Graphite in the bi-layer regime: in-plane transport[1] HRIDIS PAL, SEFAATTIN TONGAY, University of Florida, DMITRI GUTMAN, Universitat Karlsruhe, DMITRII MASLOV, ARTHUR HEBARD, University of Florida — The dependence of in-plane resistivity of HOPG graphite on temperature is studied both experimentally and theoretically over a wide range of temperatures(up to $\sim$900 K). For temperatures larger than the next-to-nearest-plane coupling which gives rise to an overlap of the valence and conduction bands, but still below the nearest-plane coupling, graphite can be viewed as a stack of bilayers. In this regime, the in-plane conductivity σ is supposed to scale as $T\tau$, where τ is the scattering time. For conventional electron-phonon scattering, $\tau \propto 1/T$ and σ is supposed to saturate at higher T. However, we observe experimentally that σ decreases monotonically without any sign of saturation up to the highest temperature measured. We propose two additional scattering mechanisms which lead to a decrease of σ: intervalley scattering by phonons and multiple intravalley scattering by phonons due to anharmonicity of a layered lattice at high temperatures. A reasonable agreement between theory and experiment is obtained by using this model.

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