Abstract Submitted
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Intrinsic carrier mobility of Dirac cones: limitations of the deformation potential theory[1] ZHENZHU LI, JINYING WANG, ZHIRONG LIU, Peking Univ — An analytic formula for the intrinsic carrier mobility of Dirac cones under acoustic phonon scattering mechanism was obtained for 2D systems such as graphene and graphyne. The influence of both transverse acoustic (TA) and longitudinal acoustic (LA) phonon modes as well as the anisotropy were considered. Some extraordinary characteristics different from the prediction of the deformation potential theory were revealed: the mobility at the neutrality point is proportional to $1/T^3$ where T is the temperature; carrier scattering by TA phonons dominates the mobility of graphene, which explains the overestimated measured deformation potential of graphene in experiments. The theory was combined with first-principles calculation to determine the mobility of graphene and five graphynes with Dirac cones. It was predicted that most graphynes possess much higher mobility than graphene due to the suppression of the scattering by TA phonons.

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