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Piezoelectric surface acoustical phonon limited mobility of electrons in graphene on a GaAs substrate[1] SAMVEL BADALYAN, Department of Physics, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerpen, Belgium, SHUHUI ZHANG, WEN XU, Key Laboratory of Materials Physics, Institute of Solid State Physics, Chinese Academy of Sciences, Hefei 230031, China, FRANCOIS PEETERS, Department of Physics, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerpen, Belgium — We study the mobility of Dirac fermions in monolayer graphene on a GaAs substrate, limited by the combined action of the extrinsic potential of piezoelectric surface acoustical phonons of GaAs (PA) and of the intrinsic deformation potential of acoustical phonons in graphene (DA). In the high temperature (T) regime the momentum relaxation rate exhibits the same linear dependence on T but different dependences on the carrier density n, corresponding to the mobility $\mu \propto 1/\sqrt{n}$ and $1/n$, respectively for the PA and DA scattering mechanisms. In the low T Bloch-Grueneisen regime, the mobility shows the same square-root density dependence, $\mu \propto \sqrt{n}$, but different temperature dependences, $\mu \propto T^{-3}$ and T^{-4}, respectively for PA and DA phonon scattering.

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