Abstract Submitted
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**On the graphene minimum conductivity from density functional theory** JUAN JOSE PALACIOS, Universidad Autonoma de Madrid — Fully quantum mechanical estimates of the minimum conductivity for unsuspended graphene are presented here. Ripples and charged impurities are considered as the sole sources of disorder and, contrary to prevailing quantum transport calculations, electron-electron interactions are included and fully accounted for in the framework of density functional theory. Our findings, for the types of disorder considered, are conclusive. (i) The conductivity always increases with respect to the clean limit value and becomes non-universal. (ii) Ripples increase the clean-limit conductivity, but do not suffice to explain the observed range of conductivity values. (iii) Charged impurities also increase the conductivity, but only when placed extremely close to graphene as, for instance, in between the graphene flake and the substrate or on top of it, can account for typical experimental values. (iv) Contrary to prevailing semiclassical theoretical estimates, the conductivity never decreases with impurity concentration for up to the highest imaginable values of this concentration. Finally, (v) our calculations corroborate previous theoretical work, agreeing with experimental findings such as the observed linear behavior of the conductivity with density as well as the observed different mobilities for electrons and holes.

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