Stopping force acting on a charged particle moving over a drift-current biased supported graphene

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In our recent publication [1] we investigated the impact of plasmon-phonon hybridization on the stopping force acting on a charged particle moving parallel to a sandwich-like structure consisting of two graphene sheets separated by a layer of sapphire.

In this work we evaluate the stopping force on a charged particle moving parallel to a graphene layer biased with a drift electric current supported by an insulating substrate.

The dielectric function of the system is written in terms of the response function of graphene and the bulk dielectric function of the substrate. Focusing on the range of frequencies from THz to mid-infrared, the response function is expressed in terms of a frequency-dependent conductivity of graphene [2]. The conductivity with a drift current is evaluated using the Galilean Doppler shift model [3-4].

The energy loss function (the imaginary part of the negative value of the inverse dielectric function) and the stopping force are presented in the cases without and with drifting electrons, showing the effects of the drift velocity on the plasmon-phonon hybridization. The stopping force is also calculated when the drift and electron beam velocities have the same and opposite signs.

REFERENCES

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