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Title:Terahertz photon mixing effect in gapped graphene
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Abstract:We theoretically calculate the terahertz waves mixing effect in doped graphene with a finite bandgap. The temperature dependence of the nonlinear intraband optical response at bandgap opening of few tens of meVare investigated. When the external electric field is weak, a moderate level of bandgap opening is found to slightly enhance the nonlinear optical response. The optical response is however significantly altered under strong-field condition. The strong-field nonlinear optical conductivity exhibits two distinct response 'hot spot': (i) low temperature with large bandgap and (ii) high temperature with small bandgap. The electric field required for the nonlinear response to dominate over the linear response is typically in the order of 10⁴ V/cm. This value increases rapidly by a factor of 10 in large bandgap and high temperature regimes. Our results suggest that photon mixing effect in gapped graphene is strongly gapped dependent and hence the bandgap opening has to be carefully engineered in order to optimize the photon mixing effect in gapped graphene. © Springer Science+Business Media, LLC 2012.
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