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Absence of a supercritical regime induced by short-range impurity scattering in gapped graphene STEPAN GRINEK, University of Alberta, ZHOU LIE, JIE CHEN, QINWEI SHI, FRANK MARSIGLIO — We show that the changes in the electronic density of states (DOS) in graphene induced by impurity scattering with short-range potentials are completely different from those caused by the long-range Coulomb potential. The spectral weight of the state that eventually disappears into the valence band (as the strength of scattering increases) does not transform into a resonance state. Therefore no unusual screening effects related to a redistribution of the density of states in the valence band are observed. The states induced by the short-range impurities in graphene, therefore, have distinctively different properties compared with the long-range potential case. These properties, in fact, closely resemble the case of a short-range single impurity in other bipartite lattices, such as the square, body centered cubic, and simple cubic lattices.

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