

Low-temperature anharmonic phonon properties of supported graphene

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Abstract: Temperature-dependent Raman studies of anharmonic
phonon-phonon processes in supported graphene are presented.
Different G peak position temperature dependencies for graphene on
glass and copper substrates were observed. Having calculated graphene-
substrate total interaction energy taking into account substrate-induced
strain, we estimated E_{2g} mode energy changes due to anharmonic
phonon-phonon interaction as the temperature decreases from room

temperature to a value close to absolute zero for both substrates. For graphene on glass, the obtained value was about 1.8 times greater than the theoretical one for suspended graphene. For graphene on copper, the value was about 2.9 times greater. This result demonstrates a strong substrate influence on anharmonic phonon-phonon processes in graphene.

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