Study of face-dependent graphene-copper interaction by heat treatment

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Abstract

The interaction between graphene and metals represents an ever more pressing issue because it determines the quality of contacts, an essential prerequisite for the correct function of intended graphene devices. In the present work we propose a simple method to estimate the level of interaction between graphene and copper single crystals with differently oriented faces – (111), (110) and (100). *In-situ* Raman spectroscopy under heat treatment clearly shows Cu face-specific behavior of the overlying graphene. Whereas for graphene on Cu(111) the interaction is in agreement with theoretical predictions and remains identical after several heating cycles, in the other two cases, the initially very weak interaction becomes even stronger after the heating than for Cu(111), resulting also in a larger charge transfer to graphene. In this way, a simple and coherent model to compare the level of interaction between graphene and copper, and its temperature-dependent evolution is provided. Furthermore, these face- and temperature-dependent variations in Cu-graphene interaction can prove imperative in successful graphene large-area growth and in the ease of its subsequent transfer to target substrates.