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Adhesive forces at interfaces between graphene and physisorbed adsorbates

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The stability of interfaces depends on the strength of interactions between graphene and the layer of adsorbed molecules. Frequently, strength of interaction is measured only by the interaction energy; mechanical stability is, however, better represented by forces. Adhesive or normal forces resist separation of the interacting surfaces, friction forces resist their relative motion. Large maximum adhesive forces resist large external pull-off forces. Adhesive forces are proportional to the derivative of the adhesion energy as function of the distance between the surfaces. We investigated the following factors influencing adhesive forces between graphene and polycyclic hydrocarbons: 1) the size of the adsorbate; 2) the shape of the adsorbate; 3) the stiffness of the adsorbate, which depends on its shape; 4) the position of the pull-off points. The strength of adsorption of polycyclic hydrocarbons on fullerenes depends also on the local curvature of the latter.

It was claimed that electron rich, polar groups enhance the interaction between adsorbates and graphene and fullerenes. We studied also the adhesive forces in such systems.

Keywords: adhesive; forces; interfaces; graphene; adsorbates

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