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Snubbing effect in atomic scale friction of graphene

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Abstract

Knowledge of the snubbing effect in atomic scale friction is essential for understanding the interaction between graphene and contacted materials in graphene composites, coatings, and nanodevices. However, current understanding of this snubbing effect is very limited. In the present study, non-equilibrium molecular dynamics is used to quantify the atomic scale snubbing friction on graphene surfaces and the effects of incline angle, tension, and surface properties. The results show evidence of a snubbing friction force that is found to range from one thousandth to one tenth of the tension in graphene. Snubbing friction behavior is found to be exponential to the inclined angle and the friction coefficient and proportional to the tension in graphene. Results shows that changes in lattice orientation and surface decoration cause variation of the friction coefficient by 5 orders of magnitude, from 0.06 to 42×10^{-3}, as a result of changes in the collision angle between atoms at the interface.

Keywords: Graphene, nanocomposite, nano-scratching, friction, molecular dynamics