

Abstract Submitted
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Complete Wetting of Graphene by Biological Membrane BINQUAN LUAN, RUHONG ZHOU, IBM T J Watson Research Center — In a very recent study, we found that surprisingly graphene nanosheets can extract large amount of lipid molecules directly out of cell membranes thus causing serious damage in cell's integrity (Nat. Nanotechnol. 8, 594, 2013). Here through extensive molecular dynamics simulations and theoretical analyses, we show that this novel phenomenon can be categorized as a complete wetting of graphene by membrane lipids in the medium of water. A wetting-based theory was developed to associate the free energy change during the extraction with the macroscopic spreading parameter. With a custom-designed thermodynamic cycle for detailed energetics, we demonstrated that the dispersive adhesion between graphene and lipids plays a dominant role during this extraction as manifested by the curved graphene.

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