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Understanding the intrinsic water wettability of graphite, graphene, and 2D materials ANDREW KOZBIAL, ZHITING LI, University of Pittsburgh, JIANING SUN, J.A. Woollam Co., XIAO GONG, FENG ZHOU, YONGJIN WANG, HAOCHEN XU, HAITAO LIU, LEI LI, University of Pittsburgh, DEPARTMENT OF CHEMICAL & PETROLEUM ENGINEERING TEAM, DEPARTMENT OF CHEMISTRY TEAM, J.A. WOOLLAM CO. INC. TEAM — Adsorption of airborne contaminants onto high energy surfaces can mask the intrinsic material properties and cause wettable surfaces to appear hydrophobic. We report the effect of airborne hydrocarbon contamination on the water wettability of graphite and its 2D counterpart, graphene. The WCA of HOPG was 64.4 $\pm$ 2.9° when measured within 10 seconds after exfoliation in air and increased to $\sim$90° after 15 minutes. Ellipsometry measurement showed growth of an adsorptive layer on exfoliated HOPG and ATR-FTIR data indicated that the layer is airborne hydrocarbon. Analogous experimental evidence on graphene indicated that a mildly hydrophilic and clean graphene surface with WCA of 44° (monolayer graphene on Copper) and 59.6° (2-3 layer graphene on Nickel) adsorbed airborne hydrocarbons resulting in a hydrophobic surface with WCA of 80°. This indicates that graphite and graphene are intrinsically mildly hydrophilic and that surface adsorbed airborne hydrocarbon is the source of hydrophobicity. The results are extended to evaluating other 2D materials - MoS_2, WS_2, BN - to further elucidate the effect of hydrocarbon contamination.

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