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Critical wetting instabilities of light gases on graphene ADRIAN DEL MAESTRO, SANGHITA SENGUPTA, NATHAN NICHOLS, VALERI KOTOV, University of Vermont — The formation of liquid films on electronically neutral substrates is dominated by the van der Waals interaction which creates an effective repulsion between the liquid-gas and liquid-substrate boundaries. We investigate wetting phenomena within the Lifshitz theory for light gases composed of hydrogen, helium and nitrogen in three different geometries where graphene is either affixed to an insulating substrate, submerged or suspended. We have discovered that the presence of graphene has a significant effect in all configurations. In particular, in the suspended case where graphene is able to wet on only one side, we find that film growth becomes arrested at a critical thickness which may trigger liquid film surface instabilities and pattern formation analogous to spinodal dewetting. We discuss experimental consequences of this novel phenomenon and potential applications in the field of two-dimensional materials-based technologies.

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