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Atomistic study of the graphene nanobubbles. EVGENY IAKOVLEV, PETR ZHILYAEV, ISKANDER AKHATOV, Skolkovo Institute of Science and Technology — A two-dimensional (2D) heterostructures can be created using 2D crystals stacking method. Substance can be trapped between the layers which leads to formation of the surface nanobubbles. We study nanobubbles trapped between graphene layers with argon atoms inside using molecular dynamics approach. For bubbles with radius in range 7-34 nm the solid close-packed state of argon is found, although according to bulk argon phase diagram the fluid phase must be observed. The universal shape scaling (constant ratio of height to radius), which is found experimentally and proved by the theory of elasticity of membranes, is also observed in our atomistic simulations. An unusual pancake shape (extremely small height to radius ratio) is found for smallest nanobubble with radius 7 nm. The nanobubbles with similar shape were experimentally observed at the interface between water and hydrophobic surface.

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