Abstract Submitted
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Towards a Theory of Disjoining Pressure in Statics and Dynamics of Liquid Nanofilms[1] ISKANDER AKHATOV, SVYATOSLAV CHUGUNOV, ARTUR LUTFURAKHMANOV, Department of Mechanical Engineering, Center for Nanoscale Science and Engineering, NDSU, Fargo, USA, SERGEY GAVRILYUK, CNRS UMR 6595, IUSTI, Marseille, FRANCE — Van der Waals attractive forces drastically change the material properties of thin liquid layers several nanometers when in contact with a solid. At this scale, the fluid is no longer homogeneous. Moreover, it has properties which analogous to those of solids. In particular, in equilibrium the stress tensor is no longer spherical. We calculate the stress tensor components and discuss the concept of "disjoining pressure" for such fluids. We use a long-wave approximation to derive the evolution of a liquid nanofilm on a substrate. Finally, we derive the equation for nanofilm dynamics by using mass conservation formulation. As an example, some characteristic parameters for statics and dynamics of liquid argon film on a pure silicon substrate are calculated according to the proposed model.

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