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Instability and rupture of thin liquid films on structured surfaces ELIZAVETA GATAPOVA, Institute of Thermophysics, SB RAS (Russia), VLADIMIR AJAEV, Southern Methodist University, OLEG KABOV, Institute of Thermophysics, SB RAS (Russia) — We investigate stability and break-up of a thin liquid film on a solid surface under the action of disjoining pressure. The solid surface is structured by parallel grooves. Air is trapped in the grooves under the liquid film. Our mathematical model takes into account the effect of slip due to presence of menisci separating the liquid film from the air inside the grooves, the deformation of these menisci due to local variations of pressure in the liquid film, and non-uniformities of the Hamaker constant. Rupture time is found to decrease due to the presence of the grooves. It is shown that simplified descriptions of the film dynamics, e.g. using the standard formulas for effective slip, can lead to significant deviations from the behaviour seen in our simulations. A new regime of self-similar behaviour is found, which is different from the known solutions for films on flat solid substrates and free liquid films.

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