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Effect of wall topography on the wavy motion on falling liquid films TATIANA GAMBARYAN-ROISMAN, KLAUS HELBIG, RALPH NASAREK, PETER STEPHAN, Chair of Technical Thermodynamics, Darmstadt University of Technology — Falling liquid films are used in various technological processes, including cooling of electronic devices and other components, water desalination, and powder production. Walls with topography often improve the performance of such processes. We use the shadow method and the chromatic white light sensor (CHR) method to study the wavy motion on falling liquid films on tubes with smooth walls and on tubes with longitudinal grooves. The measurements are performed at different distances below the film distributor. We show that the wavy pattern substantially changes on walls with topography. The wave frequency, the wave propagation velocity and the area of the liquid-gas interface decrease on grooved walls. The effect of the wall topography on the falling films stability is studied theoretically and numerically. We show that the longitudinal grooves stabilize the films flowing in the continuous regime (when the wall topography is completely flooded) and lead to increase of the wave length of the fastest growing wave, as well as to the decrease of the wave propagation velocity. A good qualitative and quantitative agreement between the numerical predictions and the experimental results has been found.

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