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Drop formation from an unstable partially wetting fluid rivulet JAVIER A. DIEZ, ALEJANDRO G. GONZÁLEZ, Instituto de Física Arroyo Seco, Universidad Nacional del Centro de la Provincia de Buenos Aires, Pinto 399, 7000, Tandil, Argentina, LOU KONDIC, Department of Mathematics, New Jersey Institute of Technology, Newark, NJ, PHILIP D. RACK, Department of Materials Science and Engineering University of Tennessee, Knoxville, TN — We consider the formation of drops by the spontaneous breakup of an unstable liquid rivulet on a horizontal substrate under partial wetting conditions. We describe the dynamics by means of a model within the lubrication approximation that includes capillarity, van der Waals forces, and gravity. We focus on gravity effects for macroscopic rivulets, and on intermolecular forces for the nanoscopic case. We find the scaling law of the emerging distance between drops (formed after the breakup process) as a function of the rivulet cross-section area. Unlike the case of thin films, the numerical results for finite length rivulets show that there is no nucleation regime, and only spinodal instability develops. Finally, we apply this model to the study of a metalic rivulet of nanometric thickness, melted via pulsed laser radiation.

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