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Air entrainment by viscous contact lines TAK SHING CHAN, University of Twente, ANTONIN MARCHAND, BRUNO ANDREOTTI, PMMH, ESPCI, Univ. Paris-Diderot, JACCO H. SNOEIJER, University of Twente — We study the entrainment of air by moving contact lines, by plunging a solid plate into a reservoir of silicone oil. Above a critical plunging velocity we observe the formation of an air film, typically of 10 microns thickness, which subsequently destabilizes to form bubbles. The breakup of the air film occurs through the nucleation of "rewetting" holes, growing regions of liquid reestablishing contact with the surface – the inverse process of the classical dewetting holes. Typical speeds for air entrainment turn out to be orders of magnitude larger than the speed for liquid film deposition. By varying the viscosity of the silicone oil, it is found that this critical speed depends on properties of both the liquid and the air. We propose an approximate hydrodynamic model that accounts for this two-phase nature of air entrainment.

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