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Break-up of drops in microfluidic T-junction ALEXANDER LESHANSKY, LEN PISMEN, Chemical Engineering, Technion-IIT — We propose a mechanism of droplet break-up in a symmetric microfluidic T-junction driven by pressure decrement in a narrow gap between the droplet and channel wall. This mechanism works in a two-dimensional setting where the capillary (Rayleigh-Plateau) instability of a cylindrical liquid thread suggested earlier [Phys. Rev. Lett. 92, 054503 (2004)] as the cause of break-up is not operative, but is likely to be responsible for the breakup also in three dimensions. We derive a dependence of the critical droplet extension on the capillary number Ca by combining a simple geometric construction for the interface shape with lubrication analysis in a narrow gap where the surface tension competes with viscous drag. The theory, formally valid for $\mathrm{Ca}^{1/5} << 1$, shows a very good agreement with numerical results when it is extrapolated to moderate values of Ca.

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