Abstract Submitted
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A Fluidic Hourglass[1] ALVARO MARIN, Bundeswehr University Munich, HENRI LHUISSIER, IUSTI, Aix-Marseille Université, MASSIMILIANO ROSSI, ANDREAS VOLK, CHRISTIAN J. KÄHLER, Bundeswehr University Munich — A group of objects passing through a constriction might get eventually stuck. It occurs no matter what type of object is considered: sand in an hourglass, particles in a fluid through a porous medium or people leaving a room in panic. The case of particles in a fluid affects porous mediums, filters and membranes, which become unusable when clogged. Certainly the adherence of the particles to the walls and to each other is an important parameter in such systems (Wyss et al., Phys. Rev. E, 2006), but even without adherence the clogging probability is far from negligible. Focusing in these low-adherence regimes, we use microfluidic devices with a bottleneck of squared cross-section through which we force dilute polystyrene particle solutions with diameters comparable to the bottleneck size and down to one tenth its size. In such low friction conditions we show experimental evidence of a strong transition at a critical particle-to-neck ratio, just as it occurs in dry granular systems (Zuriguel et al., Phys. Rev. E, 2003). We describe analytically such a transition by modeling the arch formation as a purely stochastic process, which yields a good agreement with the experimental data.

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