Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Acoustic Anti-Clogging Effect in Microfluidic Constrictions: Can Clogging Be Reduced by Simply Redistributing Particles?[1] ALVARO MARIN, Physics of Fluids, University of Twente, Enschede, The Netherlands, RUNE BARNKOB, Heinz-Nixdorf-Chair of Biomedical Electronics, Center for Translational Cancer Research, Technical University of Munich, Germany — Forcing stuff through narrow constrictions leads inevitably to clogging. Regardless the system we are dealing with: grains in silos, particles through funnels, crowds through narrow exits, or in our case, a suspension through a microfluidic constriction. Finding methods to influence and eliminate the clog formation is not only of crucial importance to improve the mass transfer in industrial systems, but also to save lives when dealing with crowds. In this work we study the effect of ultrasound actuation on a diluted suspension passing through a very narrow microfluidic constriction (from 1 up to 2 particle diameters). A standing acoustic wave with a central node in the middle of the channel induces acoustic radiation forces on the suspended particles, leading to particle migration towards the center of the channel. But, is this transversal particle redistribution – caused by the acoustic radiation force– enough to cause a substantial improvement of the mass transfer? We will present experimental and numerical results that confirm that, although ultrasound actuation indeed has a great influence on the performance of the microfluidic hourglass, the particle redistribution around the center of the channel plays only a minor role in the prevention of clogs.

[1]AM acknowledges funding from European Research Council, grant number 678573.

Alvaro Marin
Physics of Fluids, University of Twente, Enschede, The Netherlands

Date submitted: 28 Jul 2020 Electronic form version 1.4