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Experimental study of filament break-off of dense suspensions

GUSTAF MRTENSSON, Chalmers University of Technology, Sweden, Mycronic AB, Sweden, FABIAN CARSON, Mycronic AB, Sweden — As with the jet printing of dyes and other low-viscosity fluids, the jetting of dense fluid suspensions is dependent on the repeatable break-off of the fluid filament into well-formed droplets. It is well known that the break-off of dense suspensions is dependent on the volume fraction of the solid phase, particle size and morphology, fluid phase viscosity et cetera, see for example van Deen et al. (2013). The purpose of this study is to establish a deeper understanding of the break-off process of filaments of dense suspensions. The experimental set-up consists of a filament break-off device (FilBO) developed in-house. The suspension samples consist of a resin-based flux and spherical particles with diameters of $d_p = 10 - 25\mu\text{m}$. A cylindrical sample ($d_{\text{cyl}} = 1\text{ mm}$ and $h_{\text{cyl}} = 1\text{ mm}$) of the suspension is extended using a cylindrical probe travelling between $v_{\text{cyl}} = 100 - 800\text{ mm/s}$ in the vertical direction. A decrease in particle size correlates with increasing break-off length. Further results relating break-off length and rate versus particle diameter, volume fraction and probe speed will be presented. Comparisons of the filament break-off experiments with practical jetting of the suspensions will be presented.

Gustaf Mrtensson
Chalmers University of Technology, Sweden, Mycronic AB, Sweden

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