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Jamming and unjamming of foam flow in a straight channel
KARTHIK MENON, RAMA GOVINDARAJAN, SHUBHA TEWARI, TIFR Centre for Interdisciplinary Sciences, Hyderabad — Rheological studies on foams in the flowing state have focused primarily on shear driven foams. Some recent studies have begun addressing the steady flow of foams in channels where there is a strong influence of the geometry on the flow. There remain many unanswered questions about jamming characteristics of foams in simple settings where the geometry of the channel has a minimal role to play. This work aims to understand the flowing behaviour and the behaviour close to jamming in a foam flowing through a straight channel. We undertake a numerical study using the Bubble Model of D.J. Durian, due to its relevance to foams with a non-zero liquid fraction. Our study of the stress distributions and energy fluctuations during the flow, and at the onset of jamming provide some insight into the dynamics and time-scales involved in these rearrangement events. Our results indicate a shift of the flow regime from a steady to an intermittent flow close to jamming, in which rearrangements and energy relaxation become more periodic. Further, our investigations into the behaviour of contact forces and stress states of the flow add to our understanding of the jamming and unjamming characteristics of flowing foams, and aid in developing a continuum model of foam flow.

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