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Rheology of deformable droplet suspension: a lattice Boltzmann study[1] MARTINA FOGLINO, DAVIDE MARENDUZZO, Univ of Edinburgh — We study the response of a two-dimensional suspension of deformable droplets of variable area fraction to a pressure-driven flow by means of computer simulations (via the Lattice Boltzmann method). Our method allows us to study a system where droplet coalescence is disallowed, which corresponds to a model foam. We find that the viscosity of the system increases with the droplet volume fraction, and diverges for a density corresponding to jamming of the droplets: at this point, there is a yield stress to be overcome before our foam can be made to flow. Intriguingly, just before jamming, our system displays oscillations in the velocity of either the underlying fluid or of the droplets, and we discuss the mechanism leading to this phenomenon. Among relevant parameters defining our suspension we focus on the droplets surface tension K which affects the droplets ability to deform. We also find that our model foam is strongly shear thinning. Finally, we perform simulations for a poly-disperse suspension: the results qualitatively confirm those of the monodisperse suspension, but polydispersity leads to significant quantitative differences in the apparent viscosity curves.

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