Directional relaxations of elliptical particles in dense suspensions at oscillatory shear flows

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By numerical simulations we study the rheological response of dense suspensions of elliptical particles, with aspect ratio equal to 3, at oscillatory shear flows and imposed pressure. Like for the isotropic case we find that the oscillatory shear flow respect the Cox-Merz rule at large oscillatory strains but differ at low strains, with a lower viscosity compared to the steady shear and higher shear jamming packing fractions Dong (2020). However, unlike the isotropic cases (*i.e.* discs and spheres), elongated particles exhibit a very slow directional relaxation from a pre-sheared and directional ordered state at small strains, typically of order of 100 accumulative strains or 10^3-10^4 periods of oscillations Yousefian (2021). During this transient period the suspension displays a dual shear viscosity, a viscosity dependent if the shear flows are along the particles average direction or reverse to it.

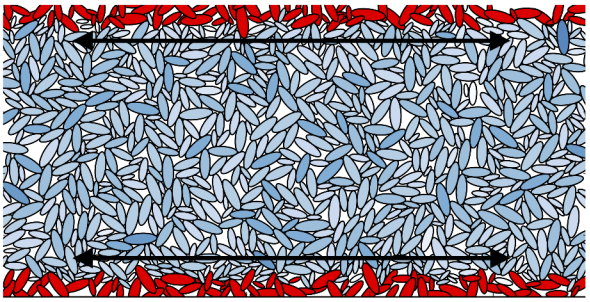

Figure 1: A typical simulation snapshot of a dense suspension composed of ellipses at oscillatory shear flow.

References

J. Dong and M. Trulsson. *Transition from steady shear to oscillatory shear rheology of dense suspensions.* Physical Review E 102 (5), 052605 (2020).

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