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Interplay of microdynamics and macrorheology in a suspension of fluid-filled soft particles BADR KAOUI, Bayreuth University, Germany — The microscopic dynamics of objects suspended in a fluid determines the macroscopic rheology of a suspension. As shown theoretically, the viscosity of a dilute suspension of vesicles is a non-monotonic function of the viscosity contrast (ratio between the viscosities of the encapsulated and the suspending fluids). By performing simulations, we recover this effect and demonstrate that it persists for a wide range of parameters such as the concentration, membrane deformability and the swelling degree. We also explain why other numerical and experimental studies lead to contradicting results. Furthermore, our simulations show that this effect even persists in non-dilute and confined suspensions, but that it becomes less pronounced at higher concentrations and for more swollen particles [Kaoui et al., Soft Matter 10, 4735 (2014)]. The interplay of inertia and deformability has also a substantial impact on rheological properties. When a suspension of soft particles is subjected to Poiseuille flow, at finite Reynolds numbers, the Segre-Silberberg effect is suppressed and a flow focusing effect emerges, which is accompanied by a non-monotonic behavior of the suspension viscosity [Krueger et al., J. Fluid Mech. 751, 725 (2014)].

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