Rheology of active colloids: motility-induced shear-thickening

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ABSTRACT

Phase transitions and collective dynamics of active colloidal suspensions are fascinating topics in soft matter physics[1], particularly for out-of-equilibrium systems, which can lead to rich rheological behaviour in presence of steady shear flow. Here the role of self-propulsion in the rheological response of a dense colloidal suspension is investigated by using particle-resolved simulations. Increasing the self-propulsion of the colloids induces a transition from a shear-thinning to a shear-thickening behaviour, which we attribute to clustering in the suspensions induced by motility, a general phenomenon which occurs close to motility-induced phase separation (MIPS)[2]. This novel behaviour of motility-induced shear thickening (MIST) can be used to tailor the rheological response of colloidal suspensions.

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