Abstract

We compared a dilute suspension of undulating rod-like particles (active suspension) with a similar one consisting of rigid rods (passive suspension) under shear flow. For the active suspension, a synchronised group of swimmers propel themselves forward by passing a travelling wave through their bodies while at the same time rotate due to planar background shear flow. Using a high resolution immersed body numerical simulations, we have shown that an active particle can exhibit complex dynamics, which is fundamentally different from a similar passive one. The orientation of the active particle consists of two separate oscillations: a low-frequency oscillation similar to the passive particle (determined by shear rate) and a high-frequency oscillation due to the body undulations. Nevertheless, different dynamics did not result in a major difference in rheological behaviour of the suspension. We found that the effective viscosity of the active suspension is equal to that of a passive one, i.e. self-propulsion did not change the viscosity of the suspension probably because of the high shear rate and inertia of our simulations.