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Suppression of resistance to flow in suspensions of bacteria HECTOR LOPEZ, FAST, Université Paris Sud, Orsay, France, JÉRÉMIE GACHELIN, PMMH-ESPCI, Paris, France, CARINE DOUARCHE, LPS, Orsay, France, ERIC CLÉMENT, PMMH-ESPCI, Paris, France, HAROLD AURADOU, FAST, Université Paris Sud, Orsay, France — It is usually believed that the influence of small amounts of bacteria on the rheological properties of a fluid is negligible. However, recent theoretical studies predict that the activity results in a decrease of the viscosity at values lower than the suspending fluid viscosity. We present experimental measurements of the viscosity of suspensions of *Escherichia coli* (volume fractions ϕ<1%) in a simple Couette flow over a broad range of shear rates. For shear rates larger than 1.5 s^{-1}, the viscosity is constant and slightly above the viscosity of the suspending fluid. This behavior is similar to the one expected for non-active particles. For lower shear rates the fluid exhibits a non-Newtonian behavior: the viscosity decreases and finally reaches a second Newtonian plateau for shear rates below 0.1 s^{-1}. For ϕ <0.6%, the decrease is proportional to the bacteria concentration, as predicted by the theories, suggesting that it is a result of the energy input of each individual microswimmer. For ϕ >0.6%, we evidence for the first time the existence of a super-lubrication regime where the viscous resistance to shear vanishes. We will demonstrate that this regime holds up over a large window of concentration.

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