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Stress relaxation in active suspensions PRABHU NOTT, Indian Institute of Science, SANKALP NAMBIAR, Jawaharlal Nehru Centre for Advanced Scientific Research, PHANI KANTH SANAGAVARAPU, Indian Institute of Science, GANESH SUBRAMANIAN, Jawaharlal Nehru Centre for Advanced Scientific Research — The rheology of 'active' suspensions has been a subject of considerable interest in recent years, but mostly under steady shear. In a recent experimental study [1], the response of a dilute suspension of *E. coli* was characterized for impulsive initiation and cessation of shear. Interesting features in the relaxation of the shear viscosity were found, as the shear rate was varied, including regimes of apparent superfluidity. Here, we report a theoretical study that attempts to explain and analyze the observed rheological response [2]. Starting from a kinetic equation appropriate for rod-shaped bacteria like *E. coli*, we determine the evolution of the orientation distribution as a function of time following a step change in the shear rate, and thereby, the temporal evolution of the bacterial contribution to the shear viscosity. Our model predictions are in excellent agreement with the experiments in the limit of small shear rates, but the predicted relaxations differ qualitatively at higher shear rates. We offer plausible arguments to explain the disparity, and suggest courses for future experimental and analytical studies that will help understand relaxation phenomena in active suspensions. [1] Lopez et al., *Phys. Rev. Lett.* **115**, 028301 (2015). [2] Nambiar et al. *J. Fluid Mech.* **812**, 41–64 (2017); Nambiar et al. *J. Fluid Mech.* **870**, 1072–1104 (2019).

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