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Shear bands in concentrated bacterial suspensions under oscillatory shear[1] XIANG CHENG, DEVRANJAN SAMANTA, University of Minnesota, Minneapolis, USA, XINLIANG XU, Beijing Computational Science Research Center, Beijing, China — Bacterial suspensions show interesting rheological behaviors such as a remarkable "superfluidic" state with vanishing viscosity. Although the bulk rheology of bacterial suspensions has been experimentally studied, shear profiles within bacterial suspensions have not been systematically explored so far. Here, by combining confocal rheometry with PIV, we investigated the flow behaviors of concentrated *E. coli* suspensions under planar oscillatory shear. We found that concentrated bacterial suspensions exhibit strong non-homogeneous flow profiles at low shear rates, where shear rates vanish away from the moving shear plate. We characterized the shape of the nonlinear shear profiles at different applied shear rates and bacterial concentrations and activities. The shear profiles follow a simple scaling relation with the applied shear rates and the enstrophy of suspensions, unexpected from the current hydrodynamic models of active fluids. We demonstrated that this scaling relation can be quantitatively understood by considering the power output of bacteria at different orientations with respect to shear flows. Our experiments reveal a profound influence of shear flows on the locomotion of bacteria and provide new insights into the dynamics of active fluids.

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