Numerical study on the shear banding of model-stabilized colloidal suspensions in the Couette flow

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Shear banding of model-stabilized colloidal suspensions in the Couette flow has been studied by self-consistent particle simulation. In this method, the fluid-particle interaction is introduced self-consistently by combining the finite element method (FEM) for fluid motion with Brownian dynamics (BD) for particle dynamics. Particle suspensions were subjected to shear flow in confined planar Couette geometry. Non-homogeneous velocity profiles and discontinuous shear rates demonstrated the existence of shear banding, which was found to originate from shear-induced alignment in the confined geometry. The effect of confinement on shear banding was investigated, and microstructure was analyzed by 2D local bond-orientation order parameter. Shear banding in confined Couette flow clearly shows the importance of flow-induced microstructures on macroscopic flow behavior.