Prediction of repulsive hard sphere colloidal particle suspensions' behavior in large amplitude oscillatory shear flow using Brownian dynamics simulation

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The micro-structure formation of colloidal suspensions under large amplitude oscillatory shear (LAOS) flow is getting more attention because those fluids are widely used in many emerging industries. We used Brownian dynamics (BD) simulation technique to obtain the information on the micro-structure and rheological properties. In our simulation, repulsive hard sphere particles were used, and we investigated the effect of volume fraction and strain amplitude of the suspension. We calculated representative stress signals in which 10 cycles' stress outcome was averaged in the same strain amplitude. To analyze this stress response quantitatively, we applied FT analysis and stress decomposition which were commonly used in analyzing LAOS data. In our BD simulation, G' and G'' showed typical suspension behavior. FT analysis and stress decomposition showed similar behavior to experimental results. Based on these observations, we could get more information on the microstructural change of colloidal suspensions under LAOS flow.