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Oscillatory shear response of the rigid-rod model in nematic regime[1] GIOVANNIANTONIO NATALE, University of Calgary, MARCO DE CORATO, Universitat de Barcelona — Nematic phase of rigid-rod molecules presents rheological complexities given the intrinsic anisotropy of the molecules and spatial variation of an average molecular orientation (director) in the bulk. This microscopic model has been investigated in simple shear flow showing complex dynamics (log-rolling, wagging and tumbling regimes). Oscillatory shear flow is a model transient flow field which introduces a transient and periodic perturbation to the system. Recently, large amplitude oscillatory shear (LAOS) has attracted interest given the rich rheological response that is obtained. However, the interpretation at the microstructural level of the LAOS response is still limited to specific systems. Here we perform numerical simulations of the Doi-Hess equation in oscillatory shear for the molecular orientational distribution function using Brownian dynamics and an expansion in spherical harmonics. A new methodology to switch between the nematic and isotropic orientation state thanks to the transient nature of the flow is proposed. Moreover, oscillatory shear flow is found to be more efficient than the simple shear flow to capture the full microstructural dynamics. Hence this methodology can provide a new strategy for experimental characterization of nematic colloidal suspensions.

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