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Theoretical analysis of dispersing of aggregated nanorods in shear flow in presence of AC electric or magnetic fields VICTOR PRYAMITSYN, VENKAT GANESAN, The University of Texas at Austin — Efficient dispersion of nanotubes in polymeric matrices is a critical problem confronting the development of modern polymer nanocomposites. The nanotube-nanotube interactions usually promote aggregation, which also depends on factors such as the chemical makeup of the polymer matrix and the size of nanotubes. High intensity mechanical mixing such shear pulverization are commonly used for dispesion of nanotubes. The main disadvantage of such processes is the degradation of polymer matrix, which may downgrade the final properties of PNC's. In this work, we theoretically explore a novel strategy to reduce the shear stresses required for dispersion of rodlike fillers. Explicitly, we found that simultaneous applications shear flow and AC electric field oriented at an angle to each other may cause rotational instabilities of the rods suspension and lead to the dispersion of the rods. We demonstrate this idea through Brownian dynamics simulations of aggregating nanorods and a complementary theoretical analysis using a 2D Smoluchowski equation. Our results suggest that an optimal dispersion may be achieved at an shear-E field orientation of $\beta = -45^\circ$ with an optimal amplitude of AC electric field which is proportional to the rotation Peclet number of nanorods suspension.

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