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Revisiting Taylor Dispersion: Differential enhancement of rotational and translational diffusion under oscillatory shear[1] BRIAN LEAHY, Department of Physics, Cornell University, DESMOND ONG, Cornell University, XIANG CHENG, ITAI COHEN, Department of Physics, Cornell University — The idea of Taylor dispersion - enhancement of translational diffusion under shear - has found applications in fields from pharmacology to chemical engineering. Here, in a combination of experiment and simulations, we study the translational and rotational diffusion of colloidal dimers under triangle-wave oscillatory shear. We find that the rotational diffusion is enhanced, in addition to the enhanced translational diffusion. This "rotational Taylor dispersion" depends strongly on the strain rate (Peclet number), aspect ratio, and the shear strain, in contradistinction to translational Taylor dispersion in a shear flow, which depends only weakly on strain rate and aspect ratio. This separate tunability of translations and orientations promises important applications in mixing and self-assembly of solutions of anisometric colloids. We discuss the corresponding effect on the structure and rheology of denser suspensions of rod-like particles.

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