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Mixing at low Reynolds number by shearing suspensions MATHIEU SOUZY, BLOEN METZGER, CHERIFA ABID, IUSTI, EMMANUEL VILLERMAUX, IRPHE, XIAOLONG YIN, Colorado School of Mines — Sheared suspensions provide a unique system where mixing spontaneously occurs even under low Reynolds numbers conditions. Under flow, particles within the fluid experience frequent collisions with one another, and are thus deviated from their laminar streamlines. Particles can be thought of as many "stirrers" inducing disturbances in the fluid phase, which produce an efficient mixing. Using index matching and laser induced fluorescence, we investigate experimentally the evolution of the concentration profiles of a layer of dye initially applied on the outer wall of a cylindrical Couette cell, in a sheared suspension of neutrally buoyant, non-Brownian particles. Close to the walls, although the particle-translational-diffusive motion is frustrated, particle rotation significantly enhances the rate of mass transfer, which is found to propagate across the gap super-diffusively. The fine-scale mixing properties of this disordered flow are investigated as well. The stretching laws of isolated scalar blobs are measured and used to infer the probability density function of the concentration in the medium.

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