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Transverse alignment of fibers in a periodically sheared suspension: An absorbing phase transition with a slowly-varying control parameter ALEXANDRE FRANCESCHINI, EMMANOUELA FILIPPIDI, Center for Soft Matter Research, Department of Physics, New York University, 10003 NY, USA, ELISABETH GUAZZELLI, IUSTI-CNRS UMR 6595, Polytech Marseille, Aix-Marseille Universite, 13453 Marseille, France, DAVID PINE, Center for Soft Matter Research, Department of Physics, New York University, 10003 NY, USA
— Shearing fibers and polymer solutions tends to align particles with the flow direction. Here, we report that neutrally buoyant non-Brownian fibers subjected to oscillatory shear are observed to align perpendicular to the flow. This alignment occurs over a finite range of strain amplitudes and is governed by a subtle interplay between fiber orientation and short-range interactions through an athermal (non-equilibrium) process known as random organization. For a given strain amplitude and concentration, the mean field orientation defines a time-dependant control parameter that can drive the suspension through an absorbing phase transition. The slow drift of the control parameter does not influence the class of the transition. The measured critical threshold and exponents are consistent with the one reported for sphere suspensions. This work was supported by the NSF through the NYU MRSEC, Award DMR:0820341. Additional support was provided by a Lavoisier Fellowship (AF) and from the Onassis Foundation (EF).

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