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Assembly of colloidal strings in a simple fluid flow YU ABE, Toray Industries, Inc. University of Minnesota, LORRAINE FRANCIS, XIANG CHENG, University of Minnesota — Colloidal particles self-assemble into ordered structures ranging from face- and body-centered cubic crystals to binary ionic crystals and to kagome lattices. Such diverse micron-scale structures are of practical importance for creating photonic materials and also of fundamental interest for probing equilibrium and non-equilibrium statistical mechanics. As a particularly interesting example, 1D colloidal strings provide a unique system for investigating non-equilibrium dynamics of crystal lattices. Here, we report a simple experimental method for constructing 1D colloidal crystals, where colloidal particles self-assemble into flow-aligned string structures near solid boundary under unidirectional flows. Using fast confocal microscopy, we explore the degree of particle alignment as functions of flow rate, particle concentrations, wetting properties of solid boundary and ionic strength of solvent. Through our systematic experiments, we show that these colloidal strings arise from hydrodynamic coupling, facilitated by electrostatic attractions between particles and the boundary. Compared with previous methods, our work provides a much simpler experimental procedure for assembling a large number of colloidal strings.

Yu Abe
Toray Industries, Inc., University of Minnesota

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