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Shear-driven gelation of dilute colloidal suspensions EMANUELA DEL GADO, ETH Zurich, ALESSIO ZACCONE, University of Cambridge, DANIELE GENTILI, HUA WU, MASSIMO MORBIDELLI, ETH Zurich, MICROSTRUCTURE AND RHEOLOGY, ETH ZURICH TEAM, CHEMISTRY AND APPLIED BIOSCIENCES, ETH ZURICH TEAM — Shear-driven solidification of dilute colloidal suspensions has dramatic impact on their applications, ranging from industrial making of paints to artificial or natural microfluidic devices and is a prototype of far from equilibrium transitions. In a set of experiments on a dilute charge-stabilized colloidal suspension, we have monitored shear-induced aggregation in a fully controlled way and rationalized the effect of the shear stress from the initially liquid suspension to the final solid. By combining light scattering, rheology and microscopy images, we show that the suspension changes, under shear, into a suspension of non-Brownian aggregates whose packing fraction increases with the shearing time. Upon flow cessation, these aggregates can eventually form cohesive random packings where each inter-aggregate bond involve a large number of colloidal bonds. Such solidification mechanism is thus a hybrid between colloidal gelation and the packing-driven jamming of non-Brownian suspensions.

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