

Fiber aggregation in flows

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When fibers are suspended in flows, they can collide and sometimes create balls. This aggregation process has been observed in natural system [1]. We are now running some experiments to reproduce this phenomenon in the lab in order to model the fiber aggregation. Recently, we observe the formation of nearly spherical aggregates in a turbulent von Kármán flow (cf. Fig. 1).

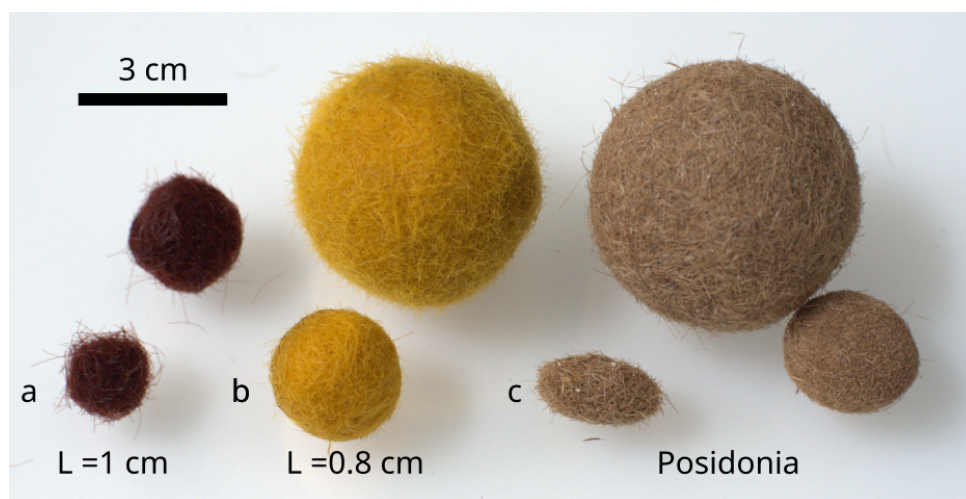


Figure 1. Images of fiber aggregates. a. and b. aggregates of nylon fiber produced in our set up. c. Natural posidonia balls found on the beach.

We are investigating the impact of the different parameters on the number and size of the aggregate, such as the forcing frequency of the flow or the mechanical properties of the fibers and their concentration. We then characterize the aggregate with tomographic images. We are able to reconstruct each fibers and the network of entangled fibers. The formation of the aggregates is expected to be a dynamical process with a balance between aggregation and fragmentation. Therefore we are also studying the fragmentation of balls independently by immersing a single aggregate within a turbulent flow and looking at its destruction.

Références

1. G. VERHILLE, S. MOULINET, N. VANDENBERGHE, M. ADDA-BEDIA, P. LE GAL, *Proceedings of the National Academy of Sciences*, **114**, 4607-4612, (2017).