Master 2 internship proposal

Physique et Mécanique des Milieux Hétérogènes

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Transport of micro-fibers in a foam

Understanding microfiber transport opens up vast fields of environmental application, from plastic pollution, when fibers are made of synthetic polymeric materials, to planktonic ecosystems, when we consider needle-shaped planktonic micro-algae such as certain diatoms. We are interested in the transport or retention of these microfibers in liquid foams, particularly when the liquid channels of the foam are the seat of a slight liquid flow due to gravity drainage. Such a configuration should make it possible to directly describe the environmental consequences of the accumulation of very abundant marine foams that can accumulate on the coastline. While the sedimentation of isotropic solid particles in foams has been widely studied in the literature, as has the sedimentation of micro-fibers in an unconfined liquid, their transport in liquid foams is not yet understood. This internship will involve an experimental exploration of this subject. A foam will be confined between two vertical plates, and a suspension of micro-fibers will be injected from above. The aim will be to quantify the dynamics of the micro-fibers released from the foam, and to observe the trajectory followed by the micro-fibers in the network of foam channels. While the emphasis will be on acquiring experimental results, a theoretical component may also be considered.

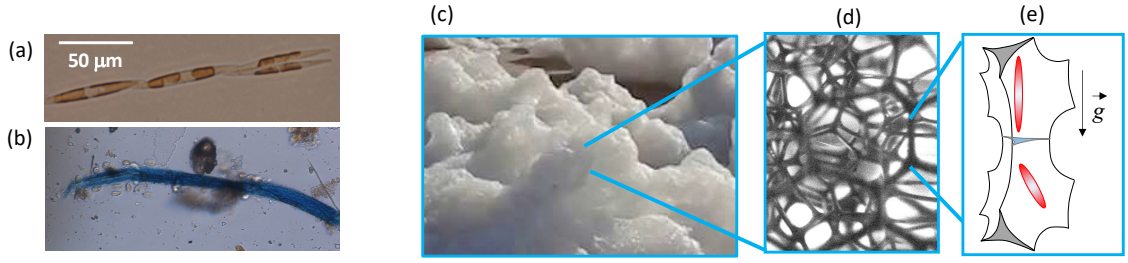

Figure 1: (a) Colony of 3 diatoms of the specie Pseudonitzschia faudulenta; (b) plastic micro-fiber sampled in the Eastern English channel (credits: E. Breton); (c) liquid foam (macroscopic scale); (d) internal structure of the foam, made of interconnected liquid channels (in black); (e) sketch of a model of transport of microfibers in a foam internal channel under gravity.

References

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