

Gelation of a Turbulent Alginate Jet in Salt Solution

Sami Yamani, Yashasvi Raj, Gareth H. McKinley, and Irmgard Bischofberger
Hatsopoulos Microfluids Lab, MIT, Cambridge, MA, USA



We use high-speed digital Schlieren imaging to visualize a jet of alginate solution injected into a quiescent bath of salt solution. The alginate solution rapidly crosslinks upon contact with the salt ions and forms a column of elastic gel. The inertia of the jet carries the gel downstream and induces a buckling-type instability that results in the deformation of the elastic gel. The crosslinking of alginate locally changes the ion density of the salt solution which results in a small density difference and hence a refractive index difference. The difference cannot be detected with the naked eye, but can be visualized with Schlieren imaging, revealing turbulent mixing patterns. The jet diameter at the nozzle is 0.5 mm.