

Breakup of aqueous (bio-)polymer solutions

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Introduction

For production of low- and nonfat food with proper texture, knowledge of non-Newtonian rheology, coalescence and break-up is essential. The objective of this study is to determine the influence of visco-elastic fluid behavior on the break-up process.

Experimental Methods

Materials

Model fluids with well defined rheological properties are produced, using aqueous solutions of:

- ◇ 0 - 50 wt% Newtonian polyethyleneglycol
- ◇ 0 - 2 wt% visco-elastic polyethyleneoxide

By varying the composition of these solutions, a large range of viscosities and elasticities is obtained.

Setup

Break-up of the model fluids is induced by the elongational flow in the stagnation point of an opposed jets device, as shown in figure 1.

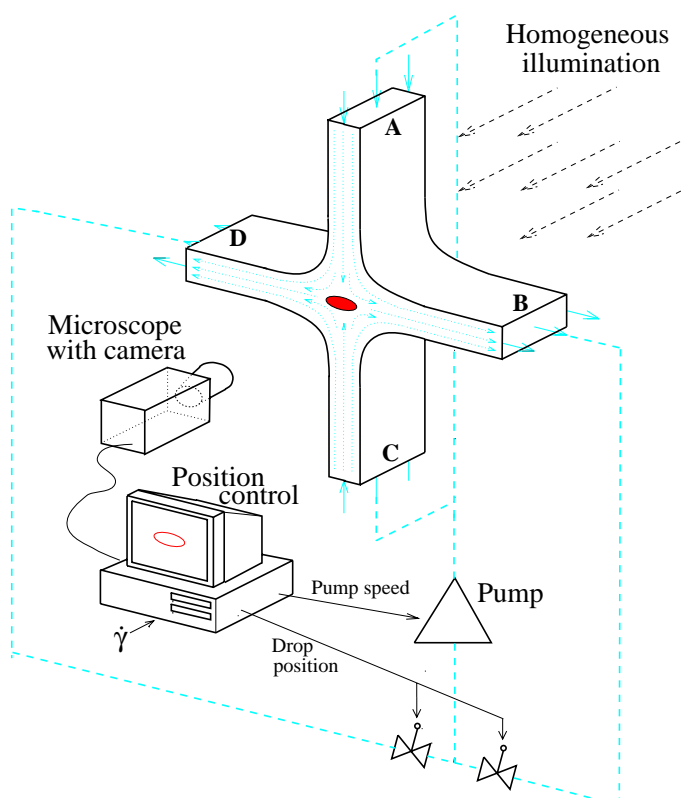
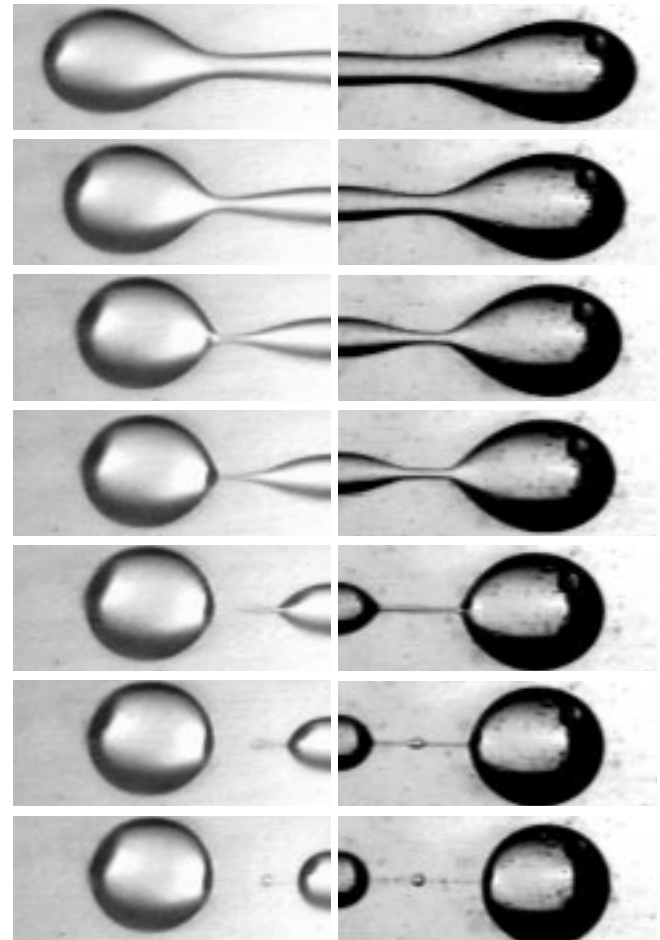


fig. 1 Opposed jets setup for break-up in elongational flow

Preliminary Results

The first experiments show a difference between breakup of visco-elastic and Newtonian droplets. In contrast to break-up of Newtonian droplets, the visco-elastic fluid drains into satellite droplets, *without* changing the shape of the filaments (fig. 2).



Newtonian droplet

Visco-elastic droplet

fig. 2 Binary break-up in a quiescent Newtonian matrix

Future Work

- ◇ Quantitative determination of the influence of *visco-elasticity* on break-up and coalescence
- ◇ Investigation of the break-up and coalescence behavior of *gelling* bio-polymer solutions
- ◇ Theoretical or experimental determination of the important parameters in these processes
- ◇ Numerical simulations of both processes

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