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Capillary stretching of elastic fibers SUZIE PROTIERE, CNRS - Institut Jean le Rond d'Alembert, HOWARD A. STONE, MAE - Princeton University, CAMILLE DUPRAT, LadHyX - Ecole Polytechnique — Fibrous media consisting of constrained flexible fibers can be found in many engineered systems (membranes in filters, woven textile, matted paper). When such materials interact with a liquid, the presence of liquid/air interfaces induces capillary forces that deform the fibers. To model this interaction we study the behaviour of a finite volume of liquid deposited on two parallel flexible fibers clamped at both ends. A tension along the fibers is imposed and may be varied. We show that the system undergoes various morphological changes as the interfiber distance, the elasticity and the tension of the fibers are varied. For a certain range of parameters, the liquid spreads along the fibers and pulls them together, leading to the "zipping" of the fibers. This capillary adhesion can then be enhanced or reduced by changing the tension within the fibers. We will show that balancing stretching and capillary forces allows the prediction of this transition as well as the conditions for which detachment of the fibers occurs. These results may be used to prevent the clogging of fibrous membranes or to optimize the capture of liquids.

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