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Capillary adhesion forces between flexible fibers CAMILLE DUPRAT, LadHyX, Ecole polytechnique, SUZIE PROTIRE, CNRS - Institut Jean le Rond d'Alembert — We consider the capillary adhesion produced by a drop placed between two elastic fibers. We measure the force exerted by the drop as we vary the inter-fiber distance, and report two types of wet adhesion: a weak capillary adhesion, where a liquid drop bridges the fibers, and a strong elastocapillary adhesion where the liquid is spread between two collapsed fibers. The weak adhesion is characterized by a force that increases linearly with the liquid length. With flexible fibers, the force exerted by the drop can induce deformation and rapid collapse, or zipping, of the fibers. This zipping results in a sudden increase of the wetted length and a force that departs from the linear evolution. As the inter-fiber distance is subsequently increased, the liquid length decreases while the fibers deformation increases, and the force actually reaches a plateau, i.e. remains constant until unzipping, or detachment of the fibers occurs. We measure the value of this plateau, i.e. the maximal adhesion force, as we vary the drop volume and the fibers elasticity. We also show that flexibility extends capillary adhesion to inter-fiber distances impossible to reach with rigid fibers, while keeping a constant pull-out force characteristic of the elastocapillary coupling.

Camille Duprat
LadHyX, Ecole polytechnique

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