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Droplet motion driven by electro-elasto-capillary effects
JAYMEEN SHAH, XIN YANG, YING SUN, Drexel University — The motion of droplets on natural and synthetic fibers underlines many technological applications including flexible displays, insulation, and smart filters. However, there is a lack of fundamental understanding of the coupled electrical, elastic, and capillary forces on droplets in fiber networks. In the present study, the motion of a water droplet suspended between two electrically insulated fibers of different Young's modulus, lengths and diameters are examined under electric fields. The results on rigid fibers reveal a critical voltage, under which the droplet remain stationary. Above this critical voltage, droplet self-propulsion is observed as a result of the interplay of electro, elasto and capillary forces on the droplet. The effects of the inter-fiber distance and Young's modulus on droplet motion are also discussed. The controllable motion of droplets can be used to manipulate or transport liquid at small scales.

Jaymeen Shah
Drexel University

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