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Droplet motion on a vibrating vertical wire¹ KARL FROHLICH, ALIREZA HOOSHANGINEJAD, SUNGHWAN JUNG, Cornell University — Dynamics of a droplet along a wire has many engineering applications. For example, wire mesh has been used to collect droplets or dust particles as a method of air filtration. In this series of theory and experimentation, we investigate how vibration of a vertical wire affects droplet motion. To that end, we test the effects of vibration in directions both normal to and in line with a vertical wire. We observe three different behaviors by the droplet under vibration: stationary, sliding, or shedding. We summarize our observations in a phase diagram characterizing these behaviors in terms of the frequency and amplitude of wire vibration as well as droplet volume. In general, we found that vibration of the wire enhanced the chance of droplet sliding and increased falling speed down the wire in the sliding regime. Finally, we attempt to develop a theoretical model to explain this behavior based on variations in contact angle hysteresis of the droplet due to the vibration. By fluctuating the advancing and receding angle of the droplet, we believe that vibration causes a decrease in the overall capillary force of the droplet, thus causing it to fall or shed from the wire.

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