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Quantifying stick-slip contact line motion of evaporating sessile droplets CLAY WOOD, JUSTIN PYE, JUSTIN BURTON, Department of Physics, Emory University — Sessile droplet evaporation often involves an apparent stick-slip motion of pinning and de-pinning of the drop's edge. The small forces and complex hydrodynamics at the contact line make this phenomena difficult to quantify, although easily observable. We have characterized the stick-slip motion on gold and glass surfaces with the use of a quartz crystal microbalance (QCM). We observe changes in both the resonant frequency and dissipation during droplet evaporation. Depositing a droplet onto this oscillating surface greatly decreases the frequency while the dissipation increases. Evaporation occurs in two stages; when the droplet's contact line is pinned to the surface, its contact angle decreases. Then, at a critical angle, the contact line is pulled over pinning points and continues to evaporate with a receding contact area. These stick-slip events appear in our data as a sharp increase in frequency, followed by a sharp decrease; simultaneously, the dissipation displays a single sharp peak. QCMs pre-cleaned in an oxygen plasma environment exhibited a significantly reduced occurrence and magnitude of these features. We interpret these features and quantify the forces involved in the stick-slip motion using a dynamic model of the QCM with additional surface forces at the contact line.

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