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Three distinct liquid drop detachment dynamics on vibrating 1D rod structure SSNG JUN LEE, KYEONGMIN KIM, WONJOON CHOI, Korea University — Along with physical impact of liquid drops, condensations can induce undesirable drop formations on solid surfaces. This outcome can possibly downgrade the heat transfer efficiency and can even contaminate sophisticated structures that may cause costs during microfabrication processes. This problem can be alleviated by vaporizing unwanted drops through controlling temperature or humidity. However, this method is cumbersome and cannot be applied in the case of viscous fluids. Thus here, we explore precise dynamics of overall fluid drop detachment on solid surfaces through damped harmonic oscillations. To model the complexity of the surfaces, we utilized 1D cantilever rods having high curvatures. The vibration of cantilever beams with small deflections (below 1 cm) were tested to see three different types of drop detachment behaviors depending on surface energy, fluid viscosities and volumes. Three dimensionless numbers (Weber, Capillary, and Bond numbers) were used to identify at which conditions the drops detach from the beam surface not affecting neighboring structures or other parts of the same body. We concluded that high gravitational and inertial forces ($We \geq 10$ and $Ca/Bo \leq 0.1$) are favorable for clean drop detachment leaving no residue on solid surfaces.

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