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Higher order resonance in electrostatically levitated liquid droplets for the measurement of surface tension[1] NEVIN BROSIUS, KEVIN WARD, EVAN WILSON, ZACHARY KARPINSKY, University of Florida Department of Chemical Engineering, SATOSHI MATSUMOTO, TAKEHIKO ISHIKAWA, Japan Aerospace Exploration Agency, MICHAEL SANSOUCIE, NASA Marshall Space Flight Center, RANGA NARAYANAN, University of Florida Department of Chemical Engineering — The Faraday forcing method in levitated liquid droplets has recently been introduced as a method for measuring surface tension using resonance. By subjecting an electrostatically-levitated liquid metal droplet to a continuous, oscillatory, electric field, at a frequency nearing that of the droplets first principal mode of oscillation (known as mode 2), the method was previously shown to determine surface tension of materials that would be particularly difficult to process by other means, e.g. liquid metals and alloys. It also offered distinct advantages over the conventional levitation-based method of pulse-decay, particularly for high viscosity samples, avoiding undesirable control system perturbations to the sample upon pulse-release. This work presents 1) a benchmarking experimental method to measure surface tension by excitation of the second principal mode of oscillation (known as mode 3) in a levitated liquid droplet and 2) a more rigorous quantification of droplet excitation using a projection method. Surface tension measurements compare favorably to literature values for Zirconium, Inconel 625, and Rhodium, using both modes 2 and 3. Thus, this new method serves as a credible, self-consistent benchmarking technique for the measurement of surface tension.

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