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Abstract

Applications of hybrid ultrasonic-electrostatic levitation to crystal growth and drop dynamics

S.K. Chung and E.H. Trinh
Jet Propulsion Laboratory
California Institute of Technology

The synergistic capabilities of ultrasonic and electrostatic fields have been applied to the levitation of single and compound charged and uncharged droplets in order to develop novel experimental methods for studying solution crystal growth and non] inear drop dynamics. In the first case, a protein solution droplet bearing a surface charge is electrostaticall y levitated and rotated along a horizontal axis during the crystal nucleation and growth phases. Ultrasonic streaming and radiation stresses arc used to induce the sample rotation and the periodic modulation of its shape. The purpose of this study is to create controlled crystal growth conditions and apparatus which would reproduce some of the aspects of the low-gravity environment. In the second case, charged or uncharged drops arc levitated under the combined action of the ultrasonic and electrostatic fields, and their response to time-varying driven modulation of the resulting stresses is anal yzed in the nonli near region. In addition to simple and compound droplets, we have investigated the dynamics of levitated single thin liquid shells and foam-like aggregates. The effects of both the ultrasonic and electrostatic fields on liquid film thinning and bubble coalescence are the subjects of i nterest. [Research funded by the Microgravity Research Division of NASA].