

PRODUCTION AND LEVITATION OF FREE DROPS OF LIQUID HELIUM*, C. G. Paine, D. Petrac, W. K. Rhim, Jet Propulsion Laboratory, Pasadena, CA 91109-8099- We are interested in the nucleation and behavior of quantized vortices and surface excitations in free drops of superfluid helium. We have constructed an apparatus to maintain liquid helium drops isolated from any material container in the earth's gravitational field, and have investigated two techniques for generating and introducing liquid drops into the region of confinement. The levitation apparatus utilizes the electrostatic force acting upon a charged liquid drop to counteract the gravitational force, with drop position stability provided by a static magnetic field acting upon the helium diamagnetic moment. Electrically neutral superfluid drops have been produced with a miniature thermomechanical pump; for a given configuration the liquid initial velocity has been varied up to several centimeters per second. Liquid drops carrying either net positive or negative charge are produced by an electrode which generates a flow of ionized liquid from the bulk liquid surface. Potentials of less than one thousand to several thousand volts are required. The mass flow is controlled by varying duration of the ionizing voltage pulse; drops as small as 30 micrometers diameter, charged to near the Rayleigh limit, have been observed.

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