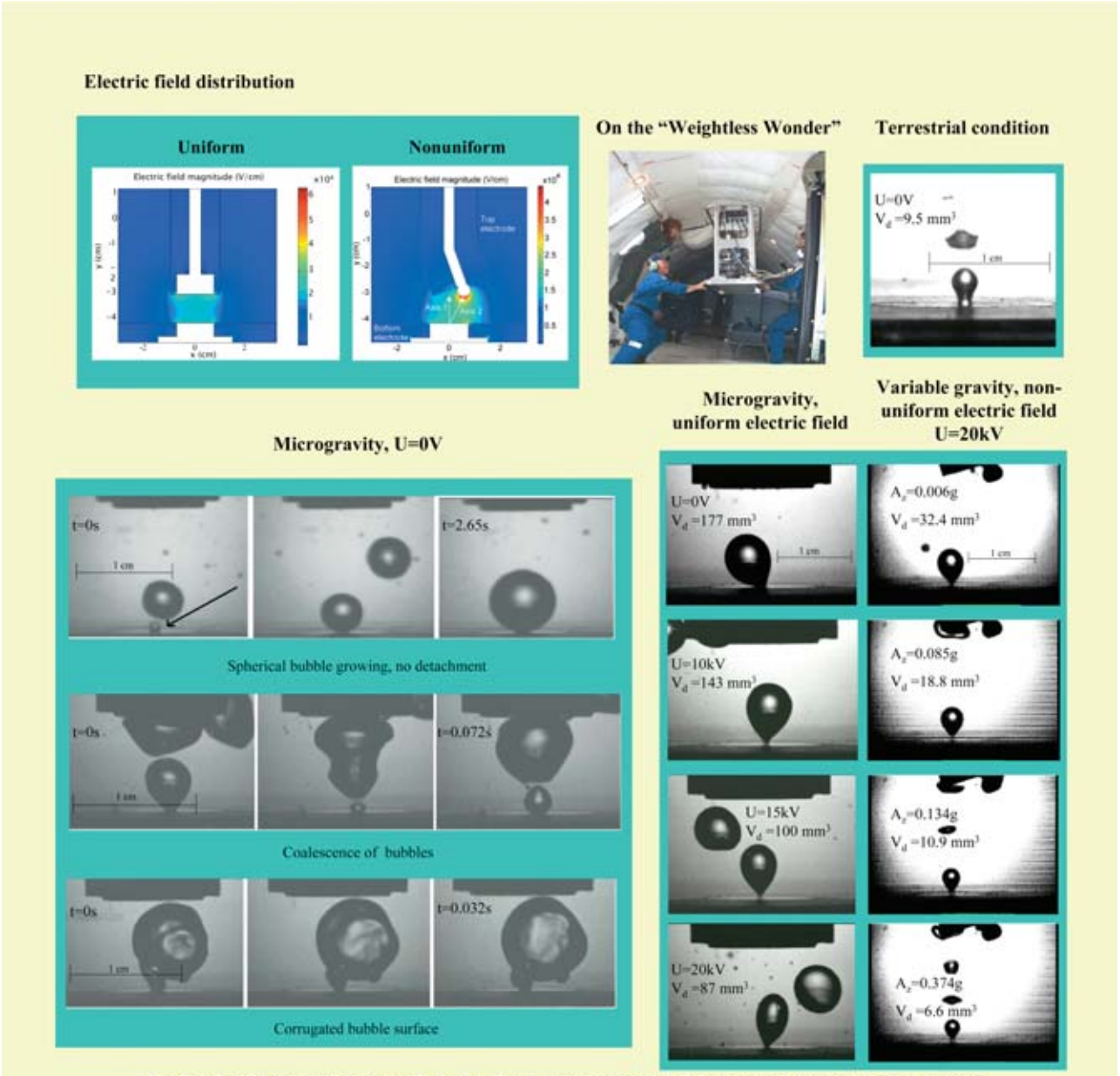

Bubble formation and detachment in variable gravity environment under the influence of electric fields

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The formation and detachment of air bubbles injected into a stagnant, isothermal liquid through an orifice in a plane surface were studied at various reduced gravity levels under the influence of electric fields. Reduced gravity experiments were carried out in NASA's reduced gravity aircraft, the KC-135. The objective of this study is to investigate and explore the possibility of substituting the buoyancy force with the electric field force by applying external electric fields in two phase flow and boiling. Two top electrode geometries were used: flat and off-axis spherical, to generate a uniform and non-uniform electric field, respectively. The bubble life cycle was first experimentally visualized, and then the characteristic dimensions of the bubble and its volume at the moment of detachment were measured using digital image processing. It is shown that both the level of gravity and the magnitude of the electric field significantly affect the bubble formation and detachment. Under microgravity with uniform electric fields, an increasing electric potential from U=0 to 20 kV decreases the detachment volume V_d by 51%. In a nonuniform electric field with U=20 kV, the detachment volume decreases by 80% as the gravity increased from 0.006g to 0.374g. The volume flow rates in variable gravity and terrestrial conditions are 2.57×10^{-7} m³/s and 3.33×10^{-7} m³/s, respectively.

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