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Capillarity-Driven Bubble Separations[1] ANDREW WOLLMAN, MARK WEISLOGEL, Portland State University, MICHAEL DREYER, ZARM — Techniques for phase separation in the absence of gravity continue to be sought after 5 decades of space flight. This work focuses on the fundamental problem of gas bubble separation in bubbly flows through open wedge-shaped channel in a microgravity environment. The bubbles appear to rise in the channel and coalesce with the free surface. Forces acting on the bubble are the combined effects of surface tension, wetting conditions, and geometry; not buoyancy. A single dimensionless group is identified that characterizes the bubble behavior and supportive experiments are conducted in a terrestrial laboratory, in a 2.1 second drop tower, and aboard the International Space Station as part of the Capillary Channel Flow (CCF) experiments. The data is organized into regime maps that provide insight on passive phase separations for applications ranging from liquid management aboard spacecraft to lab-on-chip technologies.

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