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Bubble absorption by an air-filled helically-supported capillary channel NEGAR BEHESHTIPOUR, DAVID THIESSEN, Washington State University — Gas-liquid phase separation under microgravity conditions where buoyancy is not active represents a challenge for two-phase liquid-continuous space systems. Similar challenges are present in micro-scale electrochemical systems on Earth that generate gas bubbles in geometries where surface tension prevails over gravity. A possible ground-based application would be the removal of carbon dioxide bubbles from large aspect ratio channels in a direct-methanol fuel cell that could otherwise occlude the channel. In this study we use a 3-mm diameter stretched stainless-steel spring coated with a superhydrophobic layer to create a helically-supported capillary channel. Such a channel that is submerged in water and filled with air while vented to the atmosphere was found to absorb a stream of 2.5-mm diameter air bubbles at a rate of at least 36 bubbles/s. An optical detector and high-speed imaging system have been used to study bubble absorption dynamics. A significant finding is that the initial attachment of the bubble to the channel that involves the rupture of a thin film of water happens in less than 1 ms. The rapid rupture of the water film separating the bubble from the channel might be attributed to the roughness of the hydrophobic coating.

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