Gas-Liquid Flows Through Porous Media in Microgravity: The International Space Station Packed Bed Reactor Experiment

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Abstract

Experimental results on pressure drop and flow patterns for gas-liquid flow through packed beds obtained in the International Space Station with two types of packing are presented and analyzed. It is found that the pressure drop depends on the packing wettability in the viscous-capillary (V-C) regime and this dependence is compared with previously published results developed using short duration low-gravity aircraft tests. Within the V-C regime, the capillary contribution is the dominant force contributing to the pressure drop for the wetting case (glass) versus the viscous contribution dominating for the non-wetting case (Teflon). Outside of the V-C regime, it is also found that hysteresis effects that are often strong in normal gravity gas-liquid flows are greatly diminished in microgravity and pressure drop is nearly independent of packing wettability. A flow pattern transition map from bubble to pulse flow is also compared with the earlier aircraft data.

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