

Numerical simulation of single-bubble dynamics in high-viscosity ionic liquids using the level-set method

	Authors
Danilo Carvajal, Carlos Carlesi, Victor Meléndez-Vejar, Dreidy Vásquez-Sandoval, Alessandro HA Monteverde-Videla, Samir Bensaid	
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Description

Two numerical models for studying the dynamics of formation and rise of single bubbles in high-viscosity ionic liquids were implemented using the level-set method. The models describe two stages of bubble dynamics: bubble formation at the inlet nozzle and bubble displacement across the column. The models were experimentally validated through a laboratory-scale bubble column using water-glycerol mixtures and two imidazolium-type ionic liquids. The models were consistent with the experimental tests for Reynolds numbers < 5 . Outside this range, the models tend to underestimate the bubble terminal velocity, which can be explained by the effect of the high velocity and pressure gradients close to the gas-liquid interface. The models also predicted the velocity and pressure fields near the bubble surface before and after detachment.