

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Bubble rise in a non-isothermal channel with a non-monotonic dependence of the surface tension on temperature KHELLIL SEFIANE, University of Edinburgh, MANOJ TRIPATHI, KIRTI SAHU, Indian Institute of Technology, Hyderabad, GEORGE KARAPETSAS, University of Thessaly, OMAR MATAR, Imperial College London — We examine the dynamics of a bubble rising inside a non-uniformly heated, vertically-aligned channel. A constant temperature gradient is imposed at the channel walls. We use a diffuse-interface formulation, and solve the continuity, Navier-Stokes and energy equations coupled with Cahn-Hilliard equations. A non-monotonic dependence of the surface tension on temperature is adopted, which exhibits a well-defined minimum. We focus on the effect of this functional dependence on the bubble rise dynamics, and investigate the influence of the minimum depth on the velocity and temperature fields, bubble motion and deformation. We present the results of a full parametric study of the flow dynamics, and compare our numerical predictions to experimental data.

Omar Matar
Imperial College London

Date submitted: 26 Jul 2013

Electronic form version 1.4