Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Non-isothermal bubble rise dynamics in a self-rewetting fluid MANOJ TRIPATHI, Indian Institute of Science Education and Research Bhopal, PREMLATA AMARNATH RAM, Indian Institute of Technology Hyderabad, India, GEORGE KARAPETSAS, Dept. of Mechanical Engineering, University of Thessaly, Volos 38334, Greece, KIRTI SAHU, Indian Institute of Technology Hyderabad, India, OMAR MATAR, Imperial College London, OMAR MATAR COLLABORATION, KIRTI SAHU COLLABORATION — The motion of a gas bubble in a square channel with linearly-increasing temperature in the vertical direction is investigated via three-dimensional numerical simulations. The channel contains a so-called self-rewetting fluid whose surface tension exhibits a parabolic dependence on temperature with a well-defined minimum. An open-source finite-volume fluid flow solver (Basilisk) is used with a dynamic adaptive grid refinement technique. We find that in contrast to 'ordinary' fluids with linear dependence of surface tension on temperature, the buoyancy-induced upward motion of the bubble may be enhanced or retarded by a thermocapillary-driven flow depending on the location of the bubble with respect to the position where the surface tension becomes minimum. These phenomena are observed at sufficiently small Bond numbers.

Premlata Amarnath Ram
Indian Institute of Tech Hyderabad

Date submitted: 31 Jul 2017 Electronic form version 1.4