

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Three-dimensional linear stability analysis of a rising Taylor Bubble¹ HABIB ABUBAKAR, OMAR K. MATAR, Imperial College London — The stability of a rising Taylor bubble in liquids is studied using the finite-element method. For different flow conditions, characterised by aspect ratio, dimensionless Eötvös and inverse viscosity numbers, we compute the steady state solution of a rising three-dimensional axisymmetric Taylor bubble. The linear stability of the steady state solutions to three-dimensional infinitesimal perturbations is then investigated. The analysis enables us to determine the region in parameter spaces at which a Taylor bubble becomes unstable. In this talk, we present the finite element formulations derived from the full Navier-Stokes equations for the steady-state calculations and the linear stability analysis. The methods used in solving these formulations, the validations carried out, and the results obtained for the different flow conditions studied are discussed.

¹Petroleum Technology Development Fund, EPSRC, UK, MEMPHIS program grant (EP/K003976/1), RAEng Research Chair (OKM)

Omar Matar
Imperial College London

Date submitted: 26 Jul 2017

Electronic form version 1.4