Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Rising of Taylor Bubble through a Liquid-Liquid Interface TEE TAI LIM, RAJEEV JAIMAN, HUANG SHA, National University of Singapore — A gas bubble moving through liquids in a round tube can exhibit various behaviors of both theoretical and practical interest. When the tube diameter is not too large, the large bubbles (i.e., Taylor bubbles) are smooth and glossy, with a bullet-shaped nose, and they rise at a constant velocity along the axis of the tube. The present study aims at investigating the rising of a Taylor bubble through a liquid-liquid interface both experimentally by using high-speed video camera and numerically through the volume-of-fluid (VOF) approach based on the adaptive-refinement. When a bubble risers in a liquid and eventually through a liquid-liquid interface, the interfacial force is transferred to the buoyancy and viscous forces. The layer of the heavy surrounding liquid between the bubble and the interface (termed as thin-film) prevents the bubble from reaching the light phase instantaneously. After some time, significant viscous forces, the pressure gradient within the thin-film acts to drain and eventually the film becomes exceedingly small; and bubble achieves a higher terminal rise velocity and the bubble is elongated. The preliminary results obtained by the VOF approach are in qualitative agreement with the experiment.

Rajeev Jaiman
National University of Singapore

Date submitted: 09 Aug 2012 Electronic form version 1.4