Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

An experimental and computational study of large bubble coalescence in stagnant highly viscous liquids[1] SARA MOHAMMED, EZEKIEL AGUNLEJIKA, University of Nottingham, ZHIHUA XIE, Imperial College London, BUDDHIKA HEWKANDAMBY, BARRY AZZOPARDI, University of Nottingham, OMAR MATAR, Imperial College London — The coalescence of two, and sometimes, three large bubbles rising in columns of viscous, stagnant liquids is studied experimentally and computationally. Two cases are considered: a 38 mm diameter column with a 0.12 Pa s liquid (aqueous solution of glycerol/potassium chloride); a 290 mm diameter column with a silicone oil of 330 P s viscosity. High-speed videos are taken of the coalescence process, which are characterised by the acceleration of the trailing bubble into the rear of the leading one. There is significant penetration of the trailing bubble into the leading one, with a noticeable delay prior to rupture of the thin film separating the bubbles. The velocities of the individual bubbles, as well as the bubble shapes are measured accurately. Numerical simulations of the bubble rise and coalescence process are also carried out using the parallelised, control-volume, finite-element code, *Fluidity*, which uses adaptive, unstructured meshing. The numerical results are compared with the experimental observations in terms of single bubble shape and speed, as well as the entire dynamics of two-bubble coalescence process; particular attention is focused on bubble penetration and the final stages of coalescence for the very large viscosity ratio case.

[1]EPSRC UK Programme Grant MEMPHIS (EP/K003976/1)

Omar Matar
Imperial College London

Date submitted: 01 Aug 2016 Electronic form version 1.4