Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Microbubbling viscous liquids and suspensions KETAN PANCHOLI, Department of Materials, Queen Mary, University of London, Mile End Road, London, E1 4NS, UK, MOHAN EDIRISINGHE, Department of Mechanical Engineering, University College of London, Torrington Place, London, WC1E 7JE, UK — Using a T-junction together with a cross flow technique, we have carried out a detailed study on the formation of near-monodisperse microbubbles in liquids with viscosities in the range of 5-950 mPa s. The data collected were analysed in the context of the classical momentum equation for viscous liquid flow to propose an analytical equation correlating dimensionless viscosity ratio (μ_l/μ_g) to the ratio of liquid pressure to gas pressure (P_l/P_g) required to generate bubbles. This equation is useful in predicting P_l/P_g for microbubbling a liquid having a known viscosity. Our experimental results show that in the liquids investigated, the ratio of P_l/P_g, which is a function of dynamic equilibrium of pressure of liquid and gas at the T-junction, is decreasing proportional to dimensionless viscosity ratio. We calculated radial pressure for a given liquid pressure (P_l) to establish that for liquid viscosities $\geq$ 48.5mPa s the radial velocity of liquid, which is responsible for imposing radial pressure on the gas-jet, dominates the mechanism of microbubble pinch-off. In contrast, in the low viscosity regime ($\leq$ 48.5mPa s), deceleration of the gas stream from the initial velocity is largely the cause of pinch-off of microbubbles. We made ceramic liquid foams using the technique.

Ketan Pancholi
Department of Materials, Queen Mary, University of London
Mile End Road, London, E1 4NS, UK

Date submitted: 04 Jan 2007 Electronic form version 1.4