Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Viscous drag on the translational motion of a pair of bubbles with volume oscillation MINORI SHIROTA, MASAHARU KAMEDA, Tokyo University of Agriculture and Technology — Viscous drag effects on the translational motion of bubbles with volume oscillations were studied experimentally. The translaion of a pair of bubbles in acoustic fields was observed using high-speed photography. The volume oscillations of bubbles, which cause hydrodynamic interactions between two bubbles, were also captured. Bubbles of around resonant sizes were forced to oscillate in acoustic fields having frequency of 18.0 and 34.5 kHz, and amplitude ranging from 20 to 100 kPa. The recording rate of 125,000, 250,000 and 1000,000 frames per second were used in high-speed photography. Silicone oil having kinematic viscosity of 50.0 mm^2/s was used as liquid, and air as gas. Experimental results for the translation are compared to the previous theoretical model derived by Takahira (1992). This model takes into account the diffusion of vorticity from bubble surface, and is valid even for the translation of intermediate Reynolds number. Two asymptotic models, which are valid for upper or lower limit of Reynolds number, derived by Magnaudet and Legendre (1998), are also compared to clarify the viscous effects. It is revealed that the potential flow theory overestimates the viscous drag for bubbles having the maximum radial Reynolds number of 100. Moreover, the validity of Takahira's model is verified experimentally for bubbles having Reynolds number of the order of 10.

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Date submitted: 15 Aug 2005 Electronic form version 1.4