Paper 32.6

Velocity Distributions Inside and Outside of A Water Drop in Oil

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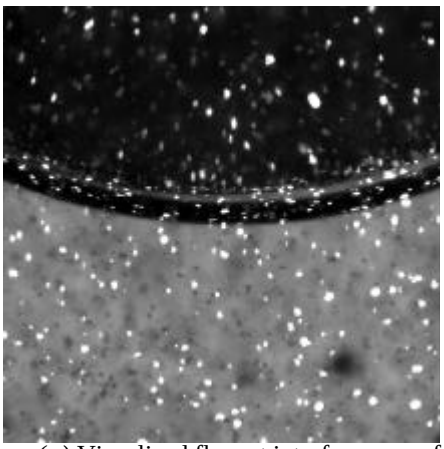
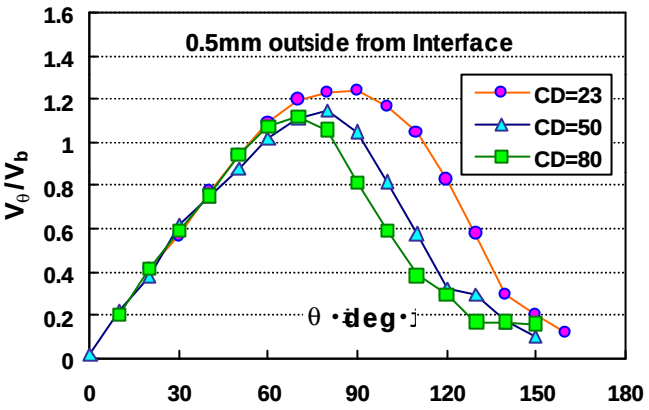
ABSTRACT

Boundary conditions at an interface between two fluids has been interested in the engineering fields relating to heat and mass transfer phenomena, since the characteristics of the boundary rule the phenomena. The quantitative information about actual boundary conditions on the interface of the two contacting fluids is also indispensable for the realistic numerical analysis of the flow. Velocity distributions in the close region to the interface are measured using a PTV technique. Variations of the shearing stresses on the interface of a water drop in oil are quantitatively evaluated. The shearing stresses drastically change in conjunction with the contamination levels, which are quantified by terminal velocities of the drop. In order to obtain pictures of drops with distinct outlines, a new visualization technique was developed. And a method to correct optical distortion of inside area of the drop is developed also.



(a) Visualized flow at interface area of a water-drop in silicone oil.



(b) Velocity distribution around and outside a water drop.

Fig.1. A flow around a sinking water-drop in oil was visualized. The water-oil interface and tracers are clearly visualized. Velocity distributions near the interface are measured using PTV.

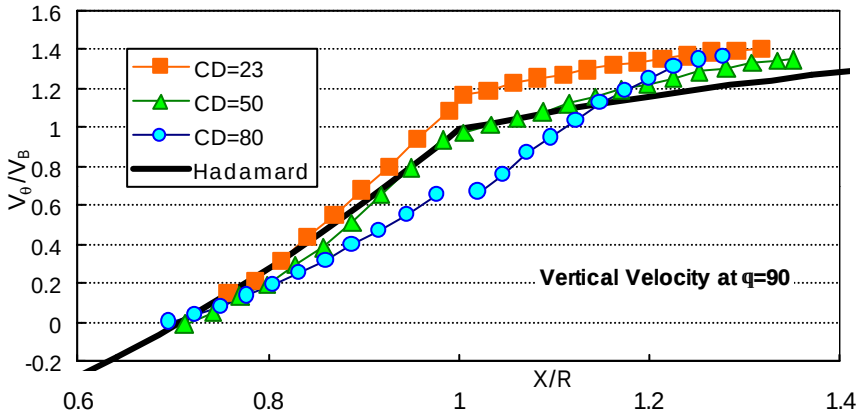


Fig.2. Velocity distributions at side of the Water drop. X/R=1 corresponds to the interface.