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Sedimentation of drops in a viscous liquid on an inclined plane.

ANOOP PAVITHRAN, BABURAJ A PUTHENVEETIL, Indian Institute of Technology Madras, Chennai , India — We present the dynamics of sedimentation of water drops ($\mu_w = 8.92 \times 10^{-4}Ns/m^2$) in silicone oil of viscosities $0.019Ns/m^2 < \mu_{si} < 0.095Ns/m^2$ on a flat plate inclined at angles ranging from $10^\circ < \alpha < 30^\circ$. The drop motion falls in the Stokes regime since Reynolds Number $Re = \frac{Ud}{\nu_{si}} < 1$. The range of Bond Number ($Bo = \frac{\Delta\rho g R^2}{\sigma}$) from $0.075 < Bo < 0.1815$ allows the shape of drop to have a flat region near the flat plate. PIV study of the drop motion shows that the viscous dissipation occurs near the drop surface and close to the wall with velocity field being the superposition of translational velocity of the drop and a rotational velocity. Based on this observed dominance of dissipation, we propose a scaling relation for the velocity of the drop, where the driving gravitational force balance the sum of the drag due to the liquid film between the drop and the plate, and the drag due to the surface of the drop.

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