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An experimental study of Mesler entrainment in silicone oil J.R. SAYLOR, G.D. BOUNDS, Clemson University — When a drop impacts a flat liquid surface, bubbles can be entrained into the bulk. At relatively low impact velocities, a large number of very small bubbles can form, a process typically referred to as Mesler entrainment. Virtually all studies of Mesler entrainment have utilized water as the working fluid. Water surfaces are notoriously difficult to maintain in a clean state and the possible effect of contaminating monolayers has clouded the extant work. In the present study, silicone oil, which is significantly less susceptible to surface contamination, was used as the working fluid, allowing us to determine the effect of contaminants. The experimental conditions were adjusted so that the range of Weber, Froude, and Capillary numbers (We, Fr, Ca) were comparable to the general range investigated in water-based studies. Several differences were observed between the silicone oil results and those for water. Of especial interest is that Mesler entrainment tends to occur either all of the time, or none of the time in silicone oil while, for water, Mesler entrainment occurs intermittently. Experiments were also conducted with a more viscous silicone oil. Here, Ca was increased by ~ 100 times while keeping the same general (We, Fr) range. Significant differences were observed in the (We, Fr) location where Mesler entrainment occurred, when compared to the lower viscosity silicone oil runs. These results are believed to be the first to reveal the effect of Ca on Mesler entrainment.

J. R. Saylor
Clemson University

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