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Behavior of embedded phase in shock-driven two-phase flow[1]
GARRETT KUEHNER, PATRICK WAYNE, DELL OLMSTEAD, CLINT CORBIN, TENNILLE BERNARD, PETER VOROBIEFF, C. RANDALL TRUMAN, The University of New Mexico — We present an experimental study of droplet acceleration in a shock-driven two-phase flow (air with embedded liquid droplets). The droplets (propylene glycol, diameter 0.5-3 μm) were pre-mixed with the air in the test section of a shock tube, then impulsively accelerated with planar shock wave with a Mach number of 1.7. A cross-section of the flow is illuminated with multiple pulses from Nd:YAG lasers, producing time-resolved visualizations of the seeded volume. The images are then analyzed to quantify droplet velocity and acceleration from the shock passage to about 1.5 ms after the shock. Based on the velocity measurements, we can resolve the droplet lag after the shock, when the massive droplets "catch up" with the flow of the surrounding air, as well as validate our earlier estimates of boundary layer growth.

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