Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Investigation of Dalton's and Amagat's laws for gas mixtures with shock propagation[1] PATRICK WAYNE, SEAN COOPER, DYLAN SIMONS, University of New Mexico Mechanical Engineering Department, IGNACIO TRUEBA-MONJE, Ohio State University Department of Mechanical and Aerospace Engineering, JAE HWUN YOO, University of Illinois Department of Aerospace Engineering, JOSIAH BIGELOW, Sandia National Laboratories, PETER VOROBIEFF, C. RANDALL TRUMAN, TIM CLARK, University of New Mexico Mechanical Engineering Department, SANJAY KUMAR, Indian Institute of Technology Kanpur — Daltons and Amagats laws are two well-known thermodynamic models describing gas mixtures. Our current research is focused on determining the suitability of these models in predicting effects of shock propagation through gas mixtures. Experiments are conducted at the Shock Tube Facility at the University of New Mexico (UNM). The gas mixture used in these experiments consists of approximately 50% sulfur hexafluoride (SF6) and 50% helium (He) by mole. Fast response pressure transducers are used to obtain pressure readings both before and after the shock wave; these data are then used to determine the velocity of the shock wave. Temperature readings are obtained using an ultra-fast mercury cadmium telluride (MCT) infrared (IR) detector, with a response time on the order of nanoseconds. Coupled with a stabilized broadband infrared light source (operating at 1500 K), the detector provides pre- and post-shock line-of-sight readings of average temperature within the shock tube, which are used to determine the speed of sound in the gas mixture. Paired with the velocity of the shock wave, this information allows us to determine the Mach number. These experimental results are compared with theoretical predictions of Daltons and Amagats laws to determine which one is more suitable.

[1]NNSA Grant DE-NA-0002913

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Date submitted: 01 Aug 2017