Public Abstract

First Name:Constantine

Middle Name:Gregory

Last Name:Avgoustopoulos

Adviser's First Name:Jacob

Adviser's Last Name:McFarland

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:The Design, Instrumentation, and Validation of a Multiphase Shock Tube Facility

This paper investigates the experimental work in Shock Driven Multiphase Instabilities (SDMI). SDMIs occur when an interface consisting of a particle seeded gas is instantaneously accelerated and begins mixing. SDMIs have similar flow morphologies to the Richtmyer-Meshkov Instability (RMI), however, the driving force inducing this flow is very different. SDMIs occur when there is a relative velocity difference between surrounding gas and the moving particles. This results to a shear at the edges and ultimately leads to rollups that are similar to a RMI. To investigate this phenomena, a shock tube facility was designed, calibrated, and tested to perform experiments. SDMIs are very important in various fields of science, they occur in gas turbines, supernovae, and in pulse detonation engines to name a few. The experimental data was qualitatively compared to simulations performed, as well as to literature of similar experiments. Quantitative data was analyzed using Particle Imaging Velocimetry (PIV) to understand the flow of the instability. The flow morphologies observed in experiments have similar behavior to those performed in simulations. Additionally, the qualitative observations of experiments performed in this lab are also in agreement with experimental literature.