

Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

The Quest For Enhanced Pulsed Slurry Atomization Via Modulation WAYNE STRASSER, Liberty University — Our non-Newtonian airblast atomization flowfield violently pulses (axially and radially) by self-generating and self-sustaining interfacial instability mechanisms. Recent work demonstrated that exothermic chemical reactions enhance this moderate Mach number atomization. Explored herein is the potential to further enhance reaction-assisted disintegration by superimposing forced mass flow variations onto otherwise constant gas feed streams. Two nozzle geometries (high and low prefilming distance) and multiple superimposed feed frequencies are considered for each gas stream. Results indicate that superimposed frequencies have potential to enhance chaotic atomization in a statistically significant manner. Ironically, the most efficient atomization did not coincide with the highest levels of gas resonance. A detailed study of reactor start-up flow reveals new mechanisms which explain performance differences. The prefilming design facilitates an isolated mixing region where secondary ignition occurs nearly immediately after startup and augments reaction product conversion.

APS Abstracts

Date submitted: 06 Sep 2019

Electronic form version 1.4