SOURCE CHARACTERISTICS OF ALUMINIZED EXPLOSIVES

RINEHART,E.J.; BABCOCK,S.M.

Ideal explosives, for example trinitrotoluene (TNT), quickly reach and maintain steady state, rate and size independent detonation conditions that are described by the classical Chapman-Jouguet Conditions. If the explosive is oxygen poor, after-burning of the detonation products may occur, however, the after-burning, is not related to the detonation specific physics other than the amount of free oxygen left. When aluminum is added to the ideal explosive, additional energy may be available from the oxidation of the aluminum. Aluminized explosives are central to many military applications to boost bomb outputs. The amount of additional available energy is dependent upon the time history of the detonation. In particular, the amount and duration of confinement on the detonation products determines the final output of the explosive (before final after-burning). One rate dependent model (Miller, Naval Surface Weapons Center) has been proposed to model TNT with 20% aluminum added, however, experimental data is lacking to fully define the parameters of the model.

An effort is currently in progress to characterize TNT mixed with 20% aluminum. Results from this work will be compared with existing (both recent and older data), pure TNT characteristic equation of state and free-air curves. This work is aimed at identifying(, obvious differences (greater than 20% in total energy) between TNT and the TNT with aluminum. Any differences identified from this on-going research from experiments will be presented. Four cases will be tested: unconfined spherical charges (TNT and aluminized TNT) at two different charge sizes, and charges detonated in steel cases (TNT and aluminized TNT). Pressure histories obtained from the experiments will be compared. Early time detonation physics will be quantified by measurements of shock time-of-arrivals (detonation velocities) measured in the explosive. Finally, close-in, free air curves will be presented for both explosive types.