ENCHANCED EFFECTS FROM ALUMINIUM ENRICHED HIGH EXPLOSIVES

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Abstract: The purpose of the present work is to study the effect of adding aluminum particles to hemi-spherical C-4 charges. While the total charge mass is kept constant, the aluminum content is systematically increased, in the range from 0 to 40 % of aluminum. Our previous studies have been concentrated on 40 µm sized particles, both in shock tube studies [1], and high explosives, whereas in the present study, 60 µm particles are used. The small-scale experiments are performed on a horizontal instrumentation table, using pressure sensors and the Edgerton Retroreflective Shadowgraph photographic technique.
Figure 1, show results for charges with aluminum particle contents, a) 0%, b) 20%, and c) 40%, respectively. The images are plotted at t = 0.57 ms after ignition. The hemispherical shock is observed as a density discontinuity propagating outwards from the charge center. As the figure illustrates, the light emission for the experiments clearly differs, with increasing light emission for increasing percentage of aluminum particle content. For the charges with the highest aluminum particle content, a reduction in peak pressure is observed at the sensors closest to the charge. The shock velocities are also reduced, while higher pressure impulse and positive duration are observed for the farthest distances.

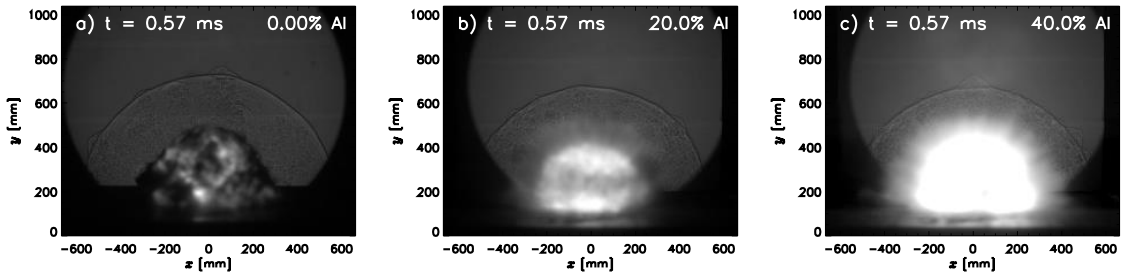

Figure 1: Edgerton Retroreflective Shadowgraph images of C-4 detonations with aluminum particle additives of a) 0% Al b) 20% Al, and c) 40% Al.

[1] Omang, M. G and Hauge, K. O. (2022). Shock ignition of aluminum particle clouds in the low temperature regime, Shock Waves 32, pp 691-701. https://doi.org/10.1007/s00193-022-01108-z