EFFECT OF PARTICLE LOADING ON THE BLAST WAVE FROM A METALIZED EXPLOSIVE

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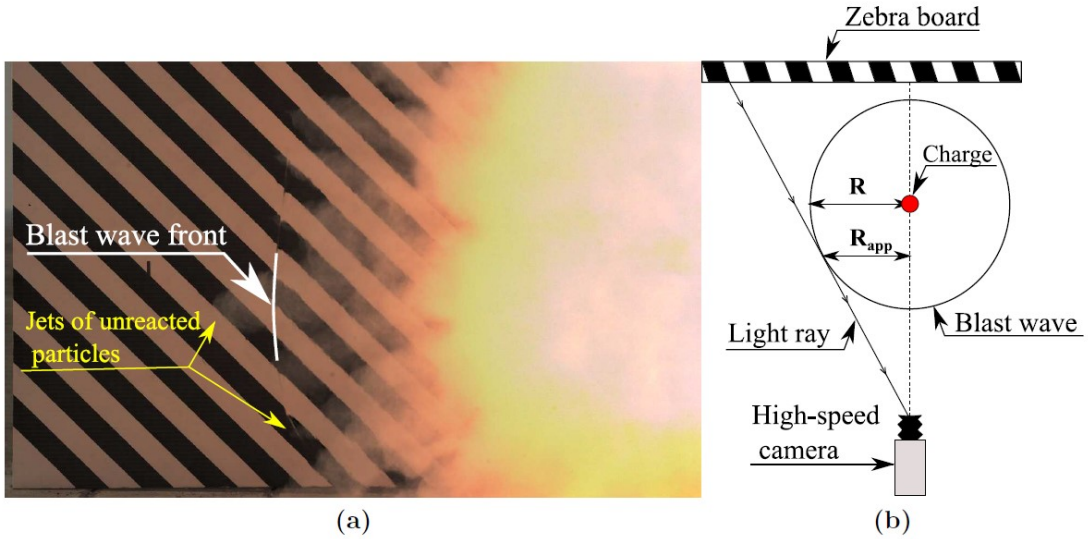
Experiments have been carried out to determine the effect of particle solid fraction and particle size on the blast wave from spherical charges consisting of gelled nitromethane with uniformly embedded aluminum particles. The blast wave overpressure is determined by tracking the blast wave propagation together with the Rankine-Hugoniot relation and the positive-phase pressure impulse is determined with fast-response piezoelectric pressure gauges. Three particle sizes were considered (13 µm, 54 µm, and 114 µm) and three solid mass fractions (10%, 30%, and 50%). The results are compared with the case of a homogeneous liquid charge and charges with the same mass fraction of suspended glass particles. For charges with aluminum, the particles react promptly in all cases with 1 L charges (nominal diameter 12.3 cm), unlike for earlier results with charges containing a packed particle bed, for which prompt particle reaction within the expanding detonation products occurs only for a critical range of particle and charge diameters. The average blast wave velocity in the near field is a measure of the contribution of the particle combustion to the blast wave propagation. The highest average blast wave velocity was obtained for the intermediate-sized particles with the highest mass loading. The dependence of peak overpressure and impulse on the charge conditions will be reported in the full paper.



a) Single frame from the video record of a test for a charge with 30% by mass of 54 µm Al particles illustrating shock tracking against Zebra board, and b) test schematic.