REACTION OF FRAGMENTS FROM CASED EXPLOSIVE CHARGES

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ABSTRACT

The effects on blast from the fragments of reactive metal cases were experimentally studied in a 23 m^3 closed chamber using a 2 kg C4 and aluminized thermobaric explosive (TBX) charge encased in a thick-walled reactive metal or steel case as well as a baseline bared charge. A double-shock front structure was observed for the reactive cased charges with an accelerating precursor shock followed by the primary shock, suggesting the early-time reaction of small case fragments. Within the first 10 ms between the first and fourth reflections on the chamber wall, the pressure rise for reactive case charges achieved a factor of 1.6 versus the steel-cased and a factor of 1.2 versus the bare charges. This indicated significant case fragment combustion at rapid reaction rates due to a large amount of small particles generated by the fragmentation through both wall impact fracturing and molten fragment aerodynamic breakup. The final quasi-static pressure for the reactive case charges reached a factor of 1.6 versus the steel cased and a factor of 1.4 versus the bare charge. The analysis of recovered fragments and solid products showed that 33 % of reactive case mass was burnt for the C4 charges but only 21 % for the TBX charges, thus indicating that the detonation pressure appears to be a more dominant parameter than the temperature in leading to an initial fragment distribution shift towards smaller fragments.