SECONDARY SHOCK MEASUREMENTS AND SIMULATIONS FOR HMX BASED COMPOSITION

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Abstract:
The blast effect is expected to be enhanced by particle and detonation products afterburning. These post-combustion processes are quite complex, because they are involved at different time-scale and locations, associated with anaerobic, aerobic reactions and turbulent mixing. In this paper, the post-combustion calculation based on the RANS (Reynolds Average Navier Stockes) hydrodynamic approach with the combustion of the detonation products and air mixing is replace by a simpler reaction rate located in the turbulent zone delimited by the air-detonation product interface and the inner characteristic starting from the interface. The calibration and the validation of the diffusion coefficient is based on dedicated experiments with different weights of the same composition. Spherical HMX based charges are tested in free field with pressure measurements from 0.5 m to 5 m and high speed cameras. The charge is positioned at 3.5 m meter height in order to avoid ground reflection during the first steps of the shock waves propagation. The primary, the secondary shock and the fireball expansion are obtained from side-on pressures and high speed cameras. For the HMX based post-combustion model, the diffusion coefficient is identified with the secondary shock data [1]. The detonation products Equation of State (EOS) is determined with the thermochemical code SIAME. Numerical simulations are performed with Ouranos hydrocode and compared with the experimental data. The shock velocity is in good agreement with the new pencil probe using two pressure gauges. The validation of the diffusion coefficient is shown with the higher charge weight.

[1] A.Lefrançois, M.Genetier, J.Suarez, N.Lecysyn, M.Lavayssiere, G.Baudin, A.Osmont, (2018), *Secondary Shock Measurement Comparison and Validation to Implement the Post-Combustion Model*, MABS25, Centre de Gramat, France