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Using Underwater Explosion and Cylinder Expansion Tests to Calibrate Afterburn Models for Aluminized Explosives[1] RASMUS WEDBERG, FOI Swedish Defence Research Agency — The study explores the combined use of underwater performance tests and cylinder expansion tests in order to parameterize detonation models for aluminized explosives which exhibit afterburning. The approach is suggested to be used in conjunction with thermochemical computation. A formulation containing RDX and aluminum powder is considered and several charges with varying masses are submerged and detonated. Pressure gauges are employed at horizontal distances scaling with the charge diameter, and the specific shock wave energy is shown to increase with charge mass. This is attributed to the combustion of aluminum particles after the Chapman-Jouguet plane. Cylinder expansion tests are carried out using Photon Doppler Velocimetry to register the wall expansion velocity. The tests are modeled using a multi-material arbitrary Lagrangian-Eulerian approach with the Guirguis-Miller model describing detonation with afterburning. The equation of state and afterburn rate law parameters are adjusted such that the model reproduces the results from the cylinder expansion and underwater tests. The approach seems promising, and might be valuable for aluminized explosive formulations intended to be used in a variety of confinement conditions.

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