P09 Experimental Study of Blast and Shock Wave Mitigation by Wet Aqueous Foams

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Abstract:

Aqueous foam acts as a blast mitigation medium through dissipation of kinetic energy. Several reasons can account for this attenuation, among which: the low sound velocity of foam relative to air and water, the resonance of bubbles and the low reflectivity in foam… According to the strength of the shockwave, one or more physical phenomena are predominant. This is still not completely understood and requires further investigation.

Experimental setups have been designed both to characterize the physical mechanisms leading to shockwave attenuation in wet aqueous foams with a density of about 100kg/m^3 and to determine the influence of the foam physical characteristics on its mitigation properties. Shock and blast interaction with foam was assessed by a macroscopic approach. On a small scale, the behavior of about 10L of foam under quasi-plane shock has been studied in a shock tube, investigating parameters such as the wave Mach number and the foam cell size. On a larger scale, pressure profiles were measured in a hemispherical volume of foam of about 1m^3 after the central detonation of a spherical explosive charge. These profiles were compared to free field measurements. A microscopic approach was conducted in the shock tube filled with a bidimensional foam in order to observe how bubbles break up during shock propagation, and attempt to correlate this phenomenon with pressure measurements.

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