STUDY OF SHOCK WAVE ATTENUATION BY MEANS OF RIGID POROUS FOAMS

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Various methods are in use in order to attenuate the strength and prolong the peak overpressure build-up duration induced by shock waves impinging on structures. It is shown that by employing the filtering properties of various structural elements such as fabrics, granular materials and foams one can achieve a substantial decrease in the force asserted on structures by blast waves. All these methods share the notion of encouraging energy dissipation due to the increased viscous drag effects on the induced flow behind the shock front. Furthermore the sharp and rapid deflection of the shock front can disperse the shock front and extend significantly the rise time to maximum over pressure. These effects are studied both experimentally and numerically on rigid alumina (Al_2O_3) open cell foams subjected to shock wave loading. The experimental apparatus comprised of an 80 mm × 80 mm square shock tube fitted with a specially designed fixture for the foams. By these means we were able to generate shock loadings. We examined both foams placed adjacent to the end-wall and foams placed with a standoff distance from the wall. Pressure transducers were mounted downstream of the flow on the target wall to monitor the developed loads. The rigid foams that were securely mounted blocked the entire area of the shock tube. The experimental results are supported by numerical calculations done by means of an "in house" one-dimensional two-phase numerical flow model for the area containing the air and the alumina foam. The results that will be presented will demonstrate the load attenuation by open-cell alumina foams on a target wall behind it. In addition, some scaling effects will be discussed.

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