BLAST WAVE ATTENUATION IN PROTECTIVE APPLICATIONS

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A common approach in the design of protective garments both for blast and impact events relies on materials which are effective energy absorbers, such as polymeric foams. The present work demonstrates that approach is not necessarily beneficial in some regimes of blast protection pertaining to personnel. Furthermore, it is shown that the mechanisms of energy absorption and dissipation within these materials become significant only for large material thicknesses that are impractical for protective applications. In fact, the blast attenuation in protective garments can be improved via dispersion or scattering of the blast front across material interfaces, which reduces the peak force/pressure and loading rate. Accordingly, the present work has focused on experimental blast loading of an idealized one-dimensional analog of a blast protection garment to compare the roles of energy absorption and force transmission as they pertain to the optimal system for blast protection, in regimes of low blast overpressures ($P2 < 5$ bar). The backing materials used for this comparison were closed-celled LDPE foams of various densities, a woven hollow structured material and bubble wrap.