P25 Numerical Study of Shock Wave Attenuation through Metallic Foam

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Abstract:

Lately, there has been a keen interest in using metallic foams as protective layers to attenuate shock waves. The mechanisms of deformation leading to the mitigation of a shock propagating in a metallic foam are still not perfectly understood and seem to depend on several factors, as diverse as the manufacturing process or the strain rate. The differences that exist between quasi-static and dynamic compression could be accounted for by the constitutive response of the foam skeleton, the densification phenomenon or micro-inertial effects.

An analytical model has been set up to take into account the effects of micro-inertia on the macroscopic foam response under dynamic loading conditions. The objective of this study is to verify the ability of our model to capture micro-inertia effects and shock attenuation. A numerical study was conducted using a bidimensional arrangement of regular elements submitted to a shock wave. This model is described by several parameters, including the constitutive material and geometrical characteristics of the unit cell, the number of layers and the amplitude of the load… With this parametric study, it is aimed to explore the capabilities of the model and to better understand the phenomena governing high strain rate deformations of metallic foams.

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