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Measurements of the shock response of porous structures formed by Selective Laser Melting ERNEST HARRIS, RON WINTER, MATTHEW COTTON, MARK SWAN, AWE — Studies of the shock loading of porous material, formed by selective laser melting, have the potential to improve our understanding of factors such as density, crush strength and pore size on energy absorbing capability. Samples have been manufactured in which a lattice is formed of rods of stainless steel angled at 45 degrees to the surface of a 6 mm thick x 64.5 mm diameter disc. The cell size is 1 mm and the density is 44.6% of solid. The effect of the cellular structure of the lattice on the temporal and spatial stress variations in the target were assessed using 3D simulation and found to be small compared with the main features of the computed record. A 70 mm gas gun has been used to impact the porous samples onto solid stainless steel plates backed by PMMA windows. The impact time was measured using piezoelectric probes and Het-V laser interferometry was used to measure the velocity time profile of the transmitted shock. The experimental results were compared with one, two and three dimensional computer predictions. It was found that the 2D simulations provide a good match to the time-averaged velocities but that the individual features in the experimental records are best matched by the 3D calculations.

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