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**Shock structure and spall behavior of porous aluminum** ZEV LOVINGER, California Institute of Technology, CHRISTIAN KETTENBEIL, SURAJ RAVINDRAN, GURUSWAMI RAVICHANDRAN, California Institute of Technology, 1200 E. California Blvd., Pasadena, CA 91125, CHRISTOPHE CZARNOTA, ALAIN MOLINARI, Laboratoire dEtude des Microstructures et de Mcanique des Matriaux, LEM3- -UMR CNRS 7239,7 rue Flix Savart BP 15082 57073 Metz, Cedex 03 France — Porous materials under shock and impact loading present significant potential for energy absorption and shock mitigation in various applications. Furthermore, additively manufactured materials which feature inherent levels of porosity due to the manufacturing process are increasingly used in shock applications. In this work, we have manufactured porous 6061 aluminum samples with different levels of porosity, by a modified process of 3D printing. To achieve pores smaller than the 3D printing resolution ($<50\mu$m), the printing parameters were altered to control the pore sizes, resulting in porosities between 2%-10%. Plate impact experiments were conducted on these materials at pressures in the range of 3 to10 GPa for which the free surface velocity was measured using a PDV. The experiments were designed to extract both the shock structure properties and spall behavior. The structure of the steady shock was characterized as a function of porosity and compared with a recent analytical model. The spall behavior was found to change significantly with increasing levels of porosity. Finally, mesoscale modeling has been carried out, to study and examine the mechanisms underlying the observed phenomena.

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