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Effects of sample temperature on spall fracture in laser shock-loaded metals between about 30 K and 1000 K THIBAUT DE RESSEGUIER, Institut P' - UPR CNRS 3346 - ENSMA, EMILIEN LESCOUTE, CEA, DAM, DIF, 91297 Arpajon, France, DIDIER LOISON, Institut P' - UPR CNRS 3346 - ENSMA, JEAN-MARC CHEVALIER, CEA, CESTA, 33114 Le Barp Cedex, France, INSTITUT P' - DPMM TEAM, CEA - DAM - DIF TEAM, CEA - CESTA TEAM
— For many years, spall fracture of shock-loaded materials has been one of the most widely studied phenomena in shock physics, for both basic and technological motivations. Laser driven shocks provide a means to investigate this process over ranges of extremely high strain rates and short durations, and they allow recovering spalled samples more easily than impact or explosive loading techniques. In this paper, we present laser shock experiments on gold, aluminium and iron, over a wide range of initial temperatures from cryogenic conditions (relevant in the context of inertial confinement fusion) to about 1000 K. Time-resolved measurements of the free surface velocity are used to determine the evolution of the spall strength with sample temperature. They are complemented by post-test observations of the recovered targets, which reveal clear changes in fracture surface morphology in the spall craters. In the case of iron, possible influences of pressure-induced phase transformations prior to tensile loading are discussed on the basis of hydrodynamic simulations.

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