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Dynamic behaviour and spall fracture of laser shock-loaded AlSi10Mg alloy obtained by Selective Laser Melting MANON LAURENCON, MATEIS, INSA-Lyon, CNRS UMR5510, F-69621, France, THIBAUT DE RESSGUIER, Institut Pprime (UPR 3346), CNRS, ENSMA, Univ. Poitiers, 86961 Futuroscope, France, DIDIER LOISON, Institut de Physique de Rennes, CNRS, Univ. Rennes 1, 35042 Rennes, France, JACQUES BAILLARGEAT, Institut Pprime (UPR 3346), CNRS, ENSMA, Univ. Poitiers, 86961 Futuroscope, France —
In the ongoing development of additive manufacturing, the range of materials obtained by such processes constantly grows and comes with specific architecture and microstructure. In this study, the high strain rate behaviour of light aluminum alloy AlSi10Mg obtained by Selective Laser Melting (SLM) has been investigated under laser shock loading and impact of thin, laser-accelerated flyer plates. Both elastic-plastic response and spall fracture have been analysed on the basis of time-resolved measurements of free surface velocity, transverse visualization of shock-induced fragmentation and post-recovery observations (microscopy and tomography). Comparing two microstructures inherited from two sets of SLM building parameters reveals the strong influence of porosity and defects (lacks of fusion) on the Hugoniot Elastic Limit and spall strength. On the other hand, these properties do not depend much on the building direction, although fracture surface morphology is shown to be largely affected by the melt pools boundaries.

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