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High strain rate fracture behavior of fused silica ANDREW RUGGIERO, University of Cassino and Southern Lazio, GIANLUCA IANNITTI, Techdyn Engineering, GABRIEL TESTA, University of Cassino and Southern Lazio, JEROME LIMIDO, JEAN LUC LACOME, LARS OLOVSSON, IMPETUS-AFEA, MARIO FERRARO, MBDA Italia, NICOLA BONORA, University of Cassino and Southern Lazio — Fused silica is a high purity synthetic amorphous silicon dioxide characterized by low thermal expansion coefficient, excellent optical qualities and exceptional transmittance over a wide spectral range. Because of its wide use in the military industry as window material, it may be subjected to high-energy ballistic impacts. Under such dynamic conditions, post-yield response of the ceramic as well as the strain rate related effects become significant and should be accounted for in the constitutive modeling. In this study, the procedure for constitutive model validation and model parameters identification, is presented. Taylor impact tests and drop weight tests were designed and performed at different impact velocities, from 1 to 100 m/s, and strain rates, from 10^2 up to 10^4 s^{-1}. Numerical simulation of both tests was performed with IMPETUS-FEA, a general non-linear finite element software which offers NURBS finite element technology for the simulation of large deformation and fracture in materials. Model parameters were identified by optimization using multiple validation metrics. The validity of the parameters set determined with the proposed procedure was verified comparing numerical predictions and experimental results for an independent designed test consisting in a fused silica tile impacted at prescribed velocity by a steel sphere.

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