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Experimental and numerical study of deformation modes of a pressed HMX-based explosive composition DIDIER PICART, JEROME VIAL, CEA DAM Le Ripault, PATRICE BAILLY, INSA Centre Val de Loire —
Safety of industrial or military explosives is still studied to prevent inadvertent ignition of pressed HMX-based explosive compositions submitted to a low-velocity impact. Our aim is to determine the dissipative mechanisms leading to the local heating of the material. To observe the dissipative mechanisms, a reversed edge-on impact test has been developed. This test enables real-time observations of the microstructural scale. No friction is observed between the biggest HMX grains and the matrix (the smallest grains, the binder and the porosity). Plasticity of HMX grains is obtained as well as damage by micro-cracking. Meanwhile, a biphasic numerical representation (HMX grains and matrix) is used to mimic our material. A comparison between experimental observations and simulations is used to determine the yield stress of HMX. The behavior of the matrix has been determined to account for the effect of strain rate and damage. Lastly, a comparison between tests and simulations has highlighted (1) that heating should rather be located in the matrix than in the biggest HMX grains and (2) that the most likely heating mechanism is the friction of micro(or meso)-cracks lips.

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