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Dynamic behavior of particulate/porous energetic materials¹

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Dynamic behavior of particulate/porous energetic materials in a broad range of impact conditions and types of deformation (shock, shear) will be discussed. Samples of these materials were fabricated using Cold Isostatic Pressing, sintering and Hot Isostatic Pressing with and without vacuum encapsulation. The current interest in these materials is due to the combination of their high strength with energy efficiency under critical conditions of mechanical deformation. They may exhibit high compressive and tensile strength with the ability to bulk distributed fracture resulting in a small size reactive fragments and possible reaction on later stages. The results of dynamic deformation and fragmentation of these materials in conditions of low velocity (10 m/s), high energy impact, under localized deformation in single and multiple shear bands generated using explosively driven Thick Walled Cylinder method will be discussed. The mechanical properties of these materials are highly sensitive to mesostructure. For example, a dynamic strength of Al-W composites with fine W particles is significantly larger than the strength of composite with the coarse W particles at the same porosity. Morphology of W inclusions had a strong effect on dynamic strength. Samples with W wires arranged in axial direction with the same volume content of components had a highest dynamic strength. Porosity in these materials can provide a strain hardening mechanism effect due to in situ densification which was observed experimentally for cold isostatically pressed Al and Al-coarse W powders. Experimental results will be compared with available numerical data.

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