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Shock-induced mechanochemistry in heterogeneous reactive powder mixtures[1] MANNY GONZALES, Air Force Research Laboratory, ASHOK GURUMURTHY, GREGORY KENNEDY, Georgia Institute of Technology, CHRISTOPHER NEEL, Air Force Research Laboratory, ARUN GOKHALE, NARESH THADHANI, Georgia Institute of Technology — The bulk response of compacted powder mixtures subjected to high-strain-rate loading conditions in various configurations is manifested from behavior at the meso-scale. Simulations at the meso-scale can provide an additional confirmation of the possible origins of the observed response. This work investigates the bulk dynamic response of Ti+B+Al reactive powder mixtures under two extreme loading configurations – uniaxial stress and strain loading – leveraging highly-resolved in-situ measurements and meso-scale simulations. Modified rod-on-anvil impact tests on a reactive pellet demonstrate an optimized stoichiometry promoting reaction in Ti+B+Al. Encapsulated powders subjected to shock compression via flyer plate tests provide possible evidence of a shock-induced reaction at high pressures. Meso-scale simulations of the direct experimental configurations employing highly-resolved microstructural features of the Ti+B compacted mixture show complex inhomogeneous deformation responses and reveal the importance of meso-scale features such as particle size and morphology and their effects on the measured response.

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