

Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Meso-scale investigation of anaerobic chemical reactivity of Ti-Al-B powder mixtures under impact loading¹ MANNY GONZALES, ASHOK GURUMURTHY, ARUN GOKHALE, NARESH N. THADHANI, Georgia Institute of Technology — Impact-initiated anaerobic chemical reactions in Ti-Al-B reactive powder mixtures under uniaxial stress conditions are investigated using a coupled experimental/computational approach. In particular, we characterize the effects of bulk composition on the threshold impact energy to initiate reaction using rod-on-anvil type tests performed on Ti-Al-B powder compacts. Statistical volume elements (SVEs) of different bulk compositions of the powder mixtures are analyzed using the continuum hydrocode CTH to quantify the effects of strain confinement and load configuration on the overall energy of the structure. These SVEs are also validated using one-point correlation functions to characterize the volume fraction and surface area of the constituents. Based on the deformation profiles from the continuum simulations, we investigate the effect of particle size distribution and clustering of Ti and B on the threshold energy required for observed reactivity. The deformation and threshold kinetic energy of the simulated system is compared with published values of the activation energy for Ti+B reactions and Al combustion in air to assess the extent of their impact-initiated reactivity.

¹Funded by DTRA grant No. HDTRA1-10-1-0038

Manny Gonzales
Georgia Institute of Technology

Date submitted: 18 Feb 2011

Electronic form version 1.4