

11th International Conference on Structural Integrity and Failure  
SIF-2018 3-6 December 2018, UWA Perth

A thermomechanical breakage model for shock-loaded granular media

EB Herbold\*, MA Homel\* and MB Rubin\*\*

\*Lawrence Livermore National Laboratory,  
L-236, P.O. Box 808, Livermore, CA 94550, USA

\*\*Faculty of Mechanical Engineering  
Technion - Israel Institute of Technology  
32000 Haifa, Israel

Email: mbrubin@tx.technion.ac.il

A large-deformation thermomechanical breakage model is developed for high pressure applications. The ideas from critical state soil mechanics via a breakage model are combined with understanding of shock-loaded solids to investigate the compaction of unconsolidated brittle granular materials. The resulting constitutive equations provide a fully coupled model containing a natural transition between granular and solid states. The model can also be used to investigate the specific contribution of each dissipation energy term to quantify the importance of the coupling between bulking and compaction responses and the magnitude of each term relative to thermal heating of material, which may be important in applications modeling ablation.