Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Quasi-static Eulerian framework for thermomechanical heterogeneous solid propellant simulations TADBHAGYA KUMAR, THOMAS JACKSON, University of Florida — Heterogeneous solid propellants find prevalent use in space missions and thus underlying physics that influences their performance becomes critical to design. Numerical simulation of propellant combustion is complex owing to multiphysics nature with a burning surface that propagates through pyrolysis law. Of interest is to predict the thermomechanical stresses and strains that might lead to damage/failure of the constituent materials of the propellant under combustion. In this work, a Eulerian framework for thermomechanical simulations of propellant combustion using the hypoelastic equation is presented. A quasi-static projection method is motivated through scaling analysis and a finite element based weak form is employed to deal with material moduli differences. The simulations are carried out in two-dimensional propellant packs and results are presented for the temperature, stress, and their effect on propellant burn rate.

Tadbhagya Kumar
University of Florida

Date submitted: 31 Jul 2019 Electronic form version 1.4