Abstract Submitted
for the TSF12 Meeting of
The American Physical Society

Coarsening of pentaerythritol tetranitrate (PETN) films as observed by absorbance spectroscopy and atomic force microscopy: a kinetic study[1] WALID HIKAL, JEFFREY PADEN, MARAUO DAVIS, BRANDON WEEKS, Texas Tech University, BRANDON L. WEEKS TEAM — Many theoretical studies have been proposed in order to understand the mechanism of PETN coarsening process. Up to date, experimental observations of surface diffusion have not been made. We present the first experimental evidence of surface diffusion of PETN as indicated by absorbance spectroscopy and atomic force microscopy (AFM) in continuous PETN nanofilms. The method is based on monitoring the change in absorbance at the center of the film as a result of the temperature gradient between the center of the film and its edges. Non-isothermal heating of the films results in an initial increased absorbance at ambient temperatures ($<60^{o}$C) as an indication of thickness increase due to surface diffusion, followed by absorbance decease due to film sublimation at relatively higher temperatures ($>70^{o}$C). Isothermal heating of the PETN films at ambient temperatures ($<60^{o}$C) reveals a thickness increase at all temperatures indicating a prominent surface diffusion-controlled coarsening process. Contact AFM images of the heated films show the early instantaneous appearance of PETN nanocrystals that linearly aligned to form one dimensional tetragonal PETN microcrystals at later times. Both isothermal and non-isothermal data are used to determine the coarsening kinetics of PETN.

[1]This work was supported by NSF CAREER (CBET-0644832) and the Office of Naval Research under project number N00014-06-1-0922.

Walid Hikal
Texas Tech University

Date submitted: 25 Sep 2012 Electronic form version 1.4