Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

Near-Failure Detonation Behavior of Vapor-Deposited Hexanitrostilbene (HNS) Films ROBERT KNEPPER, RYAN WIXOM, ALEXANDER TAPPAN, Sandia National Laboratories — Physical vapor deposition is an attractive method to produce sub-millimeter explosive samples for studying detonation behavior at near-failure conditions. In this work, we examine hexanitrostilbene (HNS) films deposited onto polycarbonate substrates using vacuum thermal sublimation. Deposition conditions are varied in order to alter porosity in the films, and the resulting microstructures are quantified by analyzing ion-polished cross-sections using scanning electron microscopy. The effects of these changes in microstructure on detonation velocity and the critical thickness needed to sustain detonation are determined. The polycarbonate substrates can act as recording plates for detonation experiments, and films near the critical thickness display distinct patterns in the dent tracks that indicate instabilities in the detonation front when approaching failure conditions. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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Date submitted: 28 Jan 2015 Electronic form version 1.4