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Multi-scale Modelling of Shock Sensitivity in Energetic Materials

MITCHELL WOOD, Sandia National Laboratories

Shock compression of energetic materials exposes the need for a wide variety of modelling and simulation capabilities due to critical length- and time-scales that easily span many orders of magnitude. For example, defects and other microstructure features give rise to hotspots which initiate chemical reactions on the nanometer and sub-nanosecond timescales, all of which complicate our predictions of sensitivity. To improve the safe use and reliability of energetic components in a time and cost effective manner, our modelling and simulation efforts need to be tightly coupled yet flexible enough to avoid shortcomings due to approximations baked into these tools. This talk will discuss the current progress and future outlook of these multi-scale efforts, with a focus on understanding the role of microstructure on the shock-to-detonation transition.