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Molecular dynamics simulation of spinning detonation in energetic AB material VASILY ZHAKHOVSKY, MIKALAI BUDZEVICH, AARON LANDERVILLE, IVAN OLEYNIK, University of South FLorida, CARTER WHITE, Naval Research Laboratory — Spinning detonation-wave structure is observed in molecular dynamics simulation of a solid energetic material (EM) confined in the round tube with smooth walls. The EM is represented by a modified AB model with adjustable barrier height for exothermic reaction AB+B $\rightarrow$ A+BB, which allows us to study the evolution of detonation-wave structure produced by instabilities of the planar detonation front as a function of physico-chemical properties of the EM material, including its thermochemistry and reactive equation of state. The planar detonation wave in a tube of relatively small radius evlolves into an unstable pulsating detonation through the development of longitudinal perturbations, which can later lead to a collapse of the detonation wave. However, as the tube radius is increased, the detonation wave structure is stabilized by a development of a single-headed spinning detonation having an unusual four-wave configuration. Further increase of the tube radius results in a multi-headed detonation structure with turbulent-like distributions of pressure and other physical variables at the front, similar to that observed in gases.

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