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Instability of planar detonation front in energetic materials MIKALAI BUDZEVICH, VASILY ZHAKHOVSKY, AARON LANDERVILLE, University of South Florida, CARTER WHITE, Naval Research Laboratory, IVAN OLEYNIK, University of South Florida — Detonation wave propagation in solid energetic materials (EMs), as described by the standard AB model, was studied using a novel moving window molecular dynamics (MW-MD) technique. Parameters of the AB model were modified to investigate the mechanisms of detonation propagation in EMs as a function of the activation barrier for the chemical reaction AB+B -> A+BB + 3 eV. For barriers below 0.2 eV, the detonation front structure remained planar irregardless of the cross-section of the sample. For higher activation barriers, the one-dimensional planar detonation evolves into a cellular detonation upon increase of one of the transverse dimensions of the sample. The cellular detonation transforms into a stable three-dimensional turbulent-like detonation upon simultaneous increase of both transverse dimensions of the sample. These various instabilities of the planar detonation front in solid EMs observed in our MW-MD simulations mirror the major regimes of gas-phase detonation, thus confirming the universal nature of detonation phenomena.

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