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**Predicting Runaway Reaction in a Solid Explosive Containing a Single Crack** SCOTT JACKSON, LARRY HILL, Los Alamos National Laboratory — Mechanically damaged high explosive (HE) undergoing deflagration has been shown capable of generating combustion pressures and flame speeds dramatically in excess of those observed in undamaged HE. Flame penetration of HE cracks large enough to support the reaction zone increases the burning surface area and rate of gas production. Cracks confine the products, elevating the local pressure and reducing the reaction zone thickness such that it can enter continually smaller-width cracks. The process appreciably increases the flame surface area and rapidly pressurizes the crack network. This runaway of pressure and burning area, termed combustion bootstrapping, can dramatically accelerate the combustion mode and in the most extreme cases may result in deflagration-to-detonation transition. The current study is intended to help predict the critical conditions required for the onset of reaction runaway in a narrow HE slot intended to simulate a well-formed crack. We discuss experiments where flames were observed to propagate though such slots at velocities up to 10 km/s, reaching pressures in excess of 1 kbar. Pressurization of the slot due to gas-dynamic choking is then used to predict the onset of runaway reaction. This model agrees with experimental pressure measurements of observed reaction runaway in slots.

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