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Non-Gurney Scaling of Explosives Heavily Loaded with Dense Inert Additives JASON LOISEAU, ANDREW HIGGINS, DAVID FROST, McGill University — For most high explosives, the ability to accelerate material to some terminal velocity scales with the ratio of material-mass to charge-mass (M/C) according to the Gurney equations. Generally, the Gurney equation for planar geometry accurately predicts the terminal velocity of the driven material until the M/C ratio is reduced to roughly 0.15 or lower; at which point gasdynamic departures from the assumptions in the model result in systematic underpredictions of the material velocity. The authors conducted a series of open-face sandwich flyer plate experiments to measure the scaling of flyer terminal velocity with M/C for a heterogeneous explosive composed of a packed bed of 280 μm steel particles saturated with amine-sensitized nitromethane (90% NM, 10% diethylenetriamine). The propulsive capability of this explosive did not scale according to a modified form of the Gurney equation. Rather, propulsive efficiency increased as the flyer plate became relatively thicker. In the present study the authors have conducted further experiments using this explosive in symmetric sandwiches as well as for normally-incident detonations initiated via a slapping foil to examine how flyer terminal velocity scales with M/C for alternative geometries and loading conditions.

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