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The dynamic compaction of sugar as a stimulant of HMX CAROLINE LOWE, MARTIN GREENAWAY, University of Cambridge — The ability of confined porous energetic materials to transition to detonation under weak impact (less than 100 m/s) has been a safety concern for many years. Porosity increases the sensitivity of an explosive to impact by facilitating energy localisation to form "hot spots." Granular materials have been studied for many years as mock porous explosives. Compaction dissipates energy; this can mainly be attributed to intergranular friction, material damage and material compression. Dissipation increases temperatures but key questions remain about how accurately continuum models quantify this dissipation. Quasi-static compaction experiments have demonstrated significant changes in bulk mechanical behaviour during loading and bed hysteresis, yet the models describe quasi-static compaction as fully reversible. To quantify the extent of dissipation during compaction, there is a need for dynamic compaction experiments undertaken over a range of strain rates. This article reports experiments on the loading response of sugar over a range of strain rates from quasi-static to fully dynamic. The experiments are used to provide closures for mathematical models of dynamic compaction and data to validate simulations.

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