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Experiments and modelling of dynamic powder compaction in the scope of deflagration to detonation transition studies[1] SEBASTIEN BODARD[2], CEA Gramat, 46500 Gramat, France, EMMANUEL LAPEBIE, CEA Gramat, 46500 Gramat, RICHARD SAUREL[3], RS2N, 83640 Saint-Zacharie, France, ERIC DANIEL, Aix-Marseille University, 13453 Marseille Cedex 13, France, ROBERT TOSELLO, DGA-TN, 83050 Toulon, France, ERIC LAFONTAINE, DGA-DS-MRIS, 92221 Bagneux, France — Understanding DDT in granular media is of prime interest for ammunition safety. However, the mechanisms involved are multiphasic, granular and multi-scale. To progress in DDT understanding it is thus necessary to focus on some mechanisms. As compaction plays a prominent role in DDT it is important to accurately model this phenomenon. In this communication, dynamic compaction of inert powder is studied to focus on the mechanical effects taking place in early stages of DDT. Both experimental and modelling aspects are considered. A novel experimental setup is designed to generate a dynamic 1D compaction. It consists in a container filled with powder and closed by a piston. A projectile launched with a gas gun impacts the piston rod to compress the powder. High-speed cameras with grain-scale resolution record the test. The velocity field is determined with image correlation. A multiphase compaction model (Saurel et al., 2010) has been implemented. Granular effects are taken into account with a granular equation of state, determined by quasi-static compaction. With additional features such as wall friction, good agreement between experiments and computations is found. The experimental apparatus is then used to study reactive powders.

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[2]Aix-Marseille University, 13453 Marseille Cedex 13, France
[3]Aix-Marseille University, 13453 Marseille Cedex 13, France Sebastien Bodard
CEA Gramat, 46500 Gramat, France

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