NUMERICAL SIMULATION OF THE PROPAGATION OF A SHOCK WAVE ABOVE THE DENSE LAYER OF PARTICLES USING THE BAER–NUNZIATO SYSTEM OF EQUATIONS

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Abstract: The paper presents the results of numerical simulation of experiments in which a shock wave of various intensity propagated over the surface of a dense layer of particles poured onto an impenetrable wall. The mathematical model is based on the two-dimensional system of Baer–Nunziato equations and takes into account intergranular stresses arising in the solid phase of particles. The computational algorithm is based on the HLLC method with a pressure relaxation procedure. The developed algorithm is efficient in the presence of strong discontinuities in the volume fraction of particles, typical for two-phase shock-wave problems associated with filling, a cloud, or a layer of particles, including locally supersonic gas flow regimes. Comparison with numerical and field experiments of other authors is carried out.

Keywords: shock wave; compaction wave; particles layer; Baer–Nunziato equations; HLLC method; pressure relaxation

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Figure Captions

Figure 1 Schematic of problem statement

Figure 2 Predicted spatial distributions of (*a*) particles volume fraction and (*b*) gas pressure at the time instant 225 μs; $\mathrm{M} = 3.5$

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