Numerical simulation of shock wave propagation over a dense particle layer using the Baer–Nunziato model

Chuprov P A[1,@] **and Utkin P S**[2]

[1] Institute for Computer-Aided Design of the Russian Academy of Sciences, Vtoraya Brestskaya 19/18, Moscow 123056, Russia
[2] Harbin Institute of Technology, Xida 92, Nangang, Harbin, Heilongjiang 150001, China

[@] petchu@mail.ru

The present study examines the possibility of numerical simulation of a strong shock wave propagating over the surface of a dense layer of particles poured onto an impermeable wall using the Baer–Nunziato two-phase flow model. This setting of the problem follows the full-scale experiment. The mathematical model is based on a two-dimensional system of the Baer–Nunziato equations [1] and takes into account intergranular stresses arising in the solid phase of particles [2]. The computational algorithm is based on the Harten–Lax–van Leer contact method with a pressure relaxation procedure. A comparison with the simulations and full-scale experiments [3] is carried out. A reasonable agreement with the experiment is obtained for the geometrical parameters of the deformed layer surface including their dependency on the intensity of the propagating shock wave. The current work suggests an explanation for this dependency.

[1] Baer M R and Nunziato J W 1986 *Int. J. Multiphase Flow* **12** 861–889
[2] Poroshyna Ya E and Utkin P S 2021 *Int. J. Multiphase Flow* **142** 103718
[3] Fan B C, Chen Z H, Jiang X H and Li H Z 2007 *Shock Waves* **16** 179–187