MODELING THE INTERACTION OF SOLIDS WITHIN THE LAGRANGIAN APPROACH IN A WIDE RANGE OF STRAIN RATES

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A topical problem in the study and prediction of the behavior of structures under high–velocity and hypervelocity impacts is the correct description of contact boundaries, the interfaces of materials. Methods based on the Euler approach to modeling do not allow an accurate description of boundary interactions. An accurate description of the boundaries is important for the analysis of the shock–wave pattern, since wave processes determine the dynamics of the stress-strain state of destruction of materials and structures under high–velocity impacts.

The purpose of the study is to develop models and a numerical algorithm for studying and predicting the behavior of materials and structures under low–velocity and hypervelocity impacts. Within the framework of the Lagrangian approach, models of the behavior of isotropic and anisotropic materials and a computational algorithm have been created, allowing parametric studies of the behavior of materials and structures in the velocity range of 100–15,000 m/s. The adequacy of the proposed approach is confirmed by experimental data.

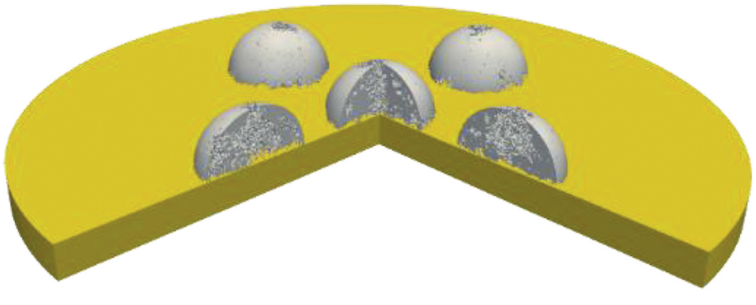

Fig. 1. Interaction of ice particles with a composite plate at a velocity of 250 m/s

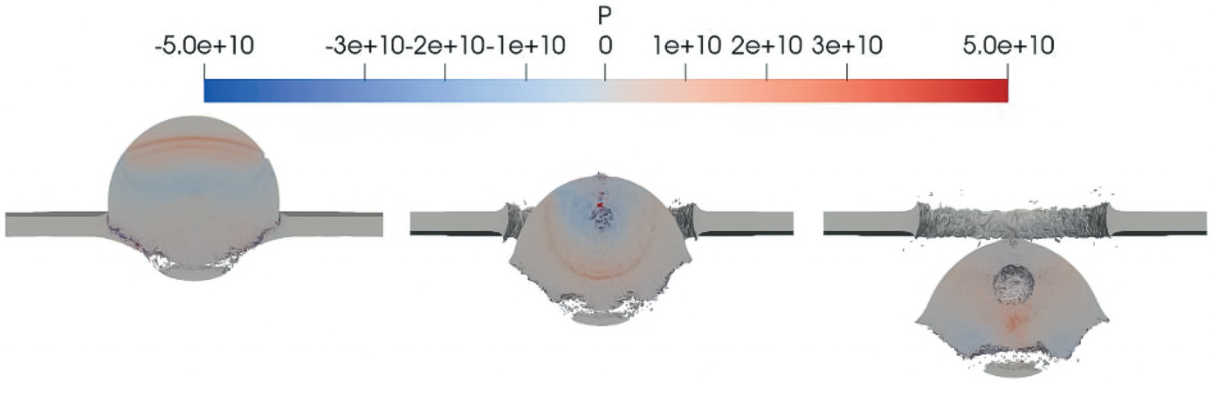

Fig. 2. Configurations of the steel particle, steel screen and pressure distribution at times of 3, 6 and 9 μs. Interaction velocity is 2300 m/s

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