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Hypervelocity Impact Problem Modeling Using Different Equations of State MIKHAIL POVARNITSYN, PAVEL LEVASHOV, KONSTANTIN KHISHCHENKO, IHED RAS — This study focuses on the simulation of hypervelocity impact problem with different equations of state. We have investigated effects of matter melting in strong shock waves, evaporation in rarefaction waves and spallation. We have found that a careful treatment of spalls formation mechanism is of greatest importance in obtaining accurate numerical results. Three types of wide range equations of state are discussed caloric equation of state of condensed phase (EOS1), thermodynamically complete stable equation of state in tabular form which forbids existence of metastable states (EOS2) and thermodynamically complete metastable equation of state in tabular form which permits the existence of metastable gas, liquid or condensed phases (EOS3). We use aluminum, lead and copper in our calculations. Initial configuration consists of impactor with diameter 15 mm traveling at 6.6 km/sec and target plate 6.35 mm thickness. Comparison of experimental X-ray photographs with results of numerical simulation has demonstrated identity in shape and size of debris cloud, backsplash, flared at the edges and even rivulets of material, possibly streaming from fractures at the edges of the hole. Differences in structure of clouds were observed mainly for their inner structure. To obtain more close resemblance with experimental data a correct model of crack growing should be taken into account.

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