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Phase transitions, high-rate straining and fracture of iron under spherical explosive loading. A.V. PETROVTSEV, E.A. KOZLOV, C.A. BRICHIKOV, V.V. DREMOV, G.V. KOVALENKO, D.A. VARFOLOMEEV, RFNC-VNIITF, Russia, A.M. BRAGOV, A.K. LOMUNOV, RIM, NNGU, Russia, A.V. DOBROMYSLOV, N.I. TALUTS, IMP, RAS, Russia, A. JUANICOTENA, M. GATULLE, CEA/DAM Ile de France, C. VOLTZ, CEA/DAM Valduc, France —
Processes that occur in iron compressed in spherical systems are characterized by: a wide range of thermodynamic and straining parameters depending on a distance from the center; polymorphous and phase transitions; spall fracture nucleation, development and re-compaction; varying energy cumulation conditions as a response to changes in the loading amplitude and duration. That is why spherical shock experiments are an important source of information and a complex test for models. The paper describes iron models developed on the basis of time- resolved measurements in planar and wedge experiments and in mechanical tests. It presents results of numerical simulations of spherical explosive recovery experiments where the size of spheres and loading parameters were varied. The features of high-rate straining in different spherical layers and their dependence on the loading parameters, EOS and elastic-plastic and fracture models were analyzed. Calculated results were compared with those of the material science investigation of recovered samples.

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