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Large tensions and strength of iron in different structure states SERGEY RAZORENOV, GENNADY KANEL, ANDREY SAVINYKH, VLADIMIR FORTOV, INSTITUTE OF PROBLEMS OF CHEMICAL PHYSICS RAS TEAM, INSTITUTE FOR HIGH ENERGY DENSITIES RAS TEAM — With the object of verifying the presence of a region of anomalous iron compressibility at negative pressures, as predicted by the *ab initio* calculations, the reflection of compression pulses from the surfaces of iron single crystals was studied. No evidence of the expected formation of rarefaction shock waves was observed in the range of attained tensile stresses up to 7.6 GPa at 293 K and at 175 K. The breaking stresses achieved 25–50% of the theoretical iron ultimate strength for a load duration of $\sim 10^{-8}$ s. The dependence of spall strength on the extension rate did not reveal any singularities in the region of assumed anomaly in iron compressibility. The spall strength of a coarse-grain Armco-iron is much less than that of single crystals. Armco-iron with a sub-micron grain size demonstrates nearly the same spall strength as the crystals do. The resistance to fracture for the different inner structure images the kinetics of void nucleation and growth on different structure levels in the material.

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