RESISTIVITY AND THERMODYNAMIC FUNCTIONS OF EXPANDED LIQUID IRON IN THE METAL-NONMETAL TRANSITION RANGE

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Measurements have been performed on iron that expanded from the initial solid state by a factor of 8 to 9 under a supercritical pressure (>20 kbar). An iron foil strip (~30 μm) sandwiched between two sapphire plates (1.5-3 mm) is heated by an electrical current pulse for less than 1 μs so that the Joule heat deposited into the sample achieves 4 to 6 the cohesion energy. As it was shown earlier [1], the experimental technique ensures sufficiently homogeneous heating and practically one-dimensional expansion of the foil strip.

The current through the sample, the voltage drop across its length, and the pressure near the sample surface are measured. From the measured quantities the electrical resistivity and pressure both as functions of density and internal energy are directly determined. This technique is described in detail for the measurements on aluminum in Ref. 1.

This work upper pressure limit is 100 kbar far above the results of our former experiments presented in NPP 2007. Besides we determined the value of density at which slope of the dependence of resistivity on specific energy changes its sign from positive to negative. It was found the density is one fifth to one sixth of the normal density of iron.

1. V. N. Korobenko and A. D. Rakhel, Phys. Rev. B, **75,** 064208 (2007).