Investigation of the compressibility of iron oxide in the terapascal pressure range

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In order to improve the accuracy of modeling various processes occurring with the release of energy in macroscopic volumes in soils and rocks associated with human activity, as well as natural origin, a universal wide-range multicomponent equation of state (EOS) is being developed at FSUE "RFNC-VNIIEF" using the mixture approximation. EOS of its components have been developed and experimental data on the compressibility of each of the components are required for their validation. Using the method for studying the quasi-isentropic compressibility of substances, an experiment was conducted with an explosive spherical loading device, the purpose of which was to obtain data on the compressibility of one of the main components of terrestrial soils and rocks - iron oxide Fe2O3 - in the range of terapascal pressures. A core of porous Fe2O3 (3,18 g/cm3) was located in the center of the device. Using the multi-frame X-ray complex of the Federal State Unitary Enterprise "RFNC-VNIIEF", seven X-ray images of the compression process were obtained. The experimentally recorded maximum average density of iron oxide was 17,1 g/cm3, at a calculated pressure of P = 3,7 TPa. The experiment also obtained direct data on the shock-wave compression of the material under study in the form of the position of the front of the converging shock wave recorded on X-ray photographs.