

Modeling the composition of the Earth's core

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The outer core of the Earth is liquid, so the equation of state (EOS) of a condensed medium is sufficient to model its characteristics and composition.

The main problem in constructing the EOS is to find the interaction potential of the particles of the medium. The problem is solved either empirically or from "first principles". The shock wave data, which can be obtained in the entire range of interest for the existence of a condensed medium, are most adequate to the problem posed.

In our work, the connection between the potential compression curve and the shock compression curve of the medium, necessary for constructing the EOS, was found from experimental data, modeling by molecular dynamics methods and qualitative substantiation.

The semiempirical EOS of a condensed medium obtained by us is used to select a light addition to the iron-nickel core of the Earth in such a way as to explain its characteristics: pressure, density, temperature and speed of seismic waves in the core.

It was found that the main necessary additive can be carbon, both in free form and in the composition of simple chemical compounds. The results of the calculations are also compared with the known data for iron and carbon, which are important elements in the physics of the Earth and in applications.