Modeling for shock-wave loading of magnesium silicates (enstatite)

Maevskii K K[1,2]

[1] Lavrentyev Institute of Hydrodynamics of the Siberian Branch of the Russian Academy of Sciences, Lavrentyev Avenue 15, Novosibirsk 630090, Russia
[2] Novosibirsk State University, Pirogova Street 2, Novosibirsk 630090, Russia

konstantinm@hydro.nsc.ru

The research on the dynamic compression of geological materials is important for understanding the composition and physical condition of the deep bowels of the Earth and other planets. These works also give an idea of the impact processes related to the formation and evolution of planets. There is a growing interest in the application for experimental investigating of geological materials under conditions of ultrahigh pressure and temperature to both new and long-standing problems about the structure and evolution of Earth depths [1]. Enstatite $Mg_2[Si_2O_6]$, and forsterite Mg_2SiO_4 are silicates that are important components for the Earth's mantles. The results of modeling the shock-wave loading of enstatite are presented. Enstatite is considered as a mixture of quartz and periclase SiO_2+MgO in this case. The model is based on the assumption that the components of the mixture are in thermodynamic equilibrium under shock-wave loading [2]. Considering the researches material in the phase transition region as a mixture of a low-pressure phase and a high-pressure phase, the model used allows us to reliably describe the polymorphic phase transition region [3]. The results are verified by experimental data obtained in dynamic experiments, which were obtained in dynamic experiments for enstatite. The good correspondence of the calculations to experimental data suggests that the model will allow us to reliably describe the behavior of other similar materials containing components undergoing a phase transition under dynamic influence, in particular forsterite Mg_2SiO_4, wollastonite $Ca_3[Si_3O_9]$.

[1] Duffy T S and Smith R F 2019 *Front. Earth Sci.* **7** 1–20
[2] Maevskii K K 2021 *Tech. Phys.* **66** 791–796
[3] Maevskii K K 2021 *Mathematica Montisnigri* **50** 140–159