Polymorphic equations of state of silicon dioxide

Nikolaev D.N.[1,@], Akhmetova M.A.[1,2], Ostrik A.V.[1,2], Nikolaev D.N.[1], Akhmetova M.A.[1,2] and Ostrik A.V.[1,2]

[1] Federal Research Center of Problems of Chemical Physics and Medicinal Chemistry of the Russian Academy of Sciences, Academician Semenov Avenue 1, Chernogolovka, 142432,
[2] Leonov Moscow Region University of Technology, Gagarina Street 42, Korolev, 141070, None

[@] nik@ficp.ac.ru

Quartz is used in dynamic experiments as a standard material in the impedance matching technique. The impedance matching technique assumes reliable equations of state (EOS) to describe the shock behavior of the standard material at high pressures. In shock compression, the transition of quartz to dense-packed structural modifications (coesite, and further stishovite) requires noticeable energy consumption, and it is important to consider the polymorphism for construction of the EOS. In this work, polymorphic EOS of crystalline silicon dioxide are built.
Constructed polymorphic EOS are used in the processing of experimental data on the shock compression of periclase (MgO). Explosive cumulative Mach generators were used to produce shock waves in single-crystal SiO2 and MgO. Shock velocities were determined from shock transit times using fiber-coupled fast optical photodetectors. The impedance matching with quartz standard with constructed EOS were used to define Hugoniot states in MgO. Simultaneously, the brightness temperature of both MgO and SiO2 was obtained by optical pyrometer. New data on shock Hugoniot of MgO were obtained.