The Stability of MgSiO₃ Perovskite at Lower Mantle Conditions

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— The stability of MgSiO₃-perovskite at lower mantle conditions has been a subject of extensive investigation and debate. Shock recovery experiments with the initial sample of (Mg₀.⁹₂, Fe₀.₀₈)SiO₃ enstatite and MgO+SiO₂ were conducted up to 120GPa. The analysis of XRD results indicate that there is no possibility for the chemical decomposition from (Mg₀.⁹₂, Fe₀.₀₈)SiO₃ to oxides SiO₂ and (Mg₀.⁹₂, Fe₀.₀₈)O under experimental shock pressure. The Gibbs energy and molar volume of all phases in the reaction MgSiO₃(Pv) = MgO(Pe) + SiO₂(St) are calculated using both the latest experimental thermodynamic parameters and the first principle molecular dynamic (MD) simulations under lower mantle conditions (1000-3500K and 30-150GPa), and the results show that perovskite is thermodynamically stable relative to the stishovite and periclase assemblage at lower mantle conditions.

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