

Temperature and compositional dependences of H₂O solubility in majorite

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ABSTRACT

We systematically investigated H₂O solubility in majorite as a function of temperature from 1670–2270 K under a pressure of 20 GPa using multi-anvil techniques. The H₂O solubility in majorite decreases with increasing temperature. In addition, the H₂O content is relatively independent of the concentrations of Al₂O₃ and SiO₂ in majorite. Majorite can store more H₂O than bridgmanite in the lower mantle. Therefore, when a slab sinks into the lower mantle, hydrous melt could be produced not only by the phase transformation from ringwoodite to bridgmanite + ferropericlase near 660 km depth but also by the majorite to bridgmanite transformation over a wide range of depths from 660 km up to ~800 km, at which majorite dissolves completely in bridgmanite.

Keywords: Majorite, H₂O solubility, transition zone, hydrous melt