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LETTERS

Isotopic and elemental partitioning of boron between hydrous fluid and silicate melt

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ABSTRACT

The fractionation of B and its isotopes between aqueous fluid and silicate melt has been studied from 550 to 1100 °C and 100–500 MPa. Fluid-melt partition coefficients are <1 for basaltic melt and >1 for rhyolite melt. This shows that B is not always strongly extracted from melts into hydrous fluids. Boron isotopic fractionation is large compared with the carbon and oxygen stable isotopic systems (especially at high *T*) and is most simply explained by differences in coordination (trigonal vs. tetrahedral) among coexisting phases. Combined with earlier measurements on illite-water (300–350 °C), B isotopic fractionation defines a temperature-dependent trend from 300 to 1100 °C. Because of the large magnitude and apparent low sensitivity to bulk composition, B isotopic fractionation can be readily applied to studies of diagenesis, hydrothermal alteration of planetary bodies, subduction-zone processing and arc magma generation, and magma chamber evolution.