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# Partitioning of Ni between olivine and an iron-rich basalt: Experiments, partition models, and planetary implications

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## Abstract

Trace element mineral-magma partitioning models are important in understanding processes by which basaltic magmas are generated. Partitioning models for nickel have been extrapolated from their original applicability for the Earth's mantle to compositions appropriate for other planets, notably the Moon and Mars. Before partitioning models can be extrapolated to explain nickel concentrations in planetary rocks, these models need to be verified thermodynamically and experimentally using planetary basaltic compositions. Experiments conducted in this study on the Martian Gusev Adirondack-class basalt, Humphrey, with 1 wt% nickel in the magma have shown that Ni affects its liquidus phase relations. By stabilizing olivine to higher temperatures, Ni increases the liquidus temperature. These experiments have shown that the Hart and Davis (1978) model based on iron-free systems cannot be extrapolated to planetary, iron-rich, basaltic systems. This work verifies the independence of the Jones (1984, 1995) and Beattie et al. (1991) models from temperature and pressure effects and suggests extrapolation to planetary compositions is justified but needs further verification. Furthermore, these experiments support the Longhi and Walker (2006) hypothesis that at high temperature nickel may be incompatible.

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