

Applications of interface enrichment factor to mantle geochemistry

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Segregation of incompatible elements at grain interfaces may have considerable influence on the physical and chemical properties of mantle rocks. Using a recently developed predictive model to estimate the interface enrichment of elements based on their mineral/melt partitioning (Hiraga and Kohlstedt, GCA 2007), we consider interface enrichment for a simplified model peridotite consisting of olivine, orthopyroxene, and clinopyroxene. Our calculated results reveal the following (Hiraga, Hirschmann and Kohlstedt, GCA, 2007): 1) Significant amounts of heavy alkali elements and rare gases likely reside at grain-grain interfaces, whereas interface concentrations of less incompatible are less pronounced. 2) The contribution of the chemical components stored at interfaces to whole-rock chemistry strongly depends on mineral mode and, most importantly, on grain size. 3) Grain size reduction resulting from dynamic recrystallization can increase the total storage of highly incompatible elements on grain interfaces and thereby will diminish their concentration in mineral grains. 4) Analysis of Cs concentrations in mantle clinopyroxenes potentially provides estimates of the grain size of mantle rocks. 5) Transport through peridotite will be dominated by diffusion along interfaces rather than through grain interiors for elements less compatible than Lu.