

Seminar 12 (to follow Lecture 14)

“Diffusive fractionation of trace elements during production and transport of melt in earth’s upper mantle”, by Van Orman, Grove and Shimizu, EPSL, 18, 93-112, 2002.

For background see “Diffusion in solid-earth systems”, by Watson and Baxter, EPSL, 253, 307-327, 2007.

Clearly, equilibrium is an end-member state that is perhaps not commonly attained, especially when solid state diffusion is part of the process, such as in Fractional Crystallization, Fractional Melting, and Chromatography (see lectures 10, 11 and 14, respectively). In this paper van Orman et al. find that diffusive fractionation during percolation through depleted spinel peridotite can lead to a wide variety of REE patterns in the melt, depending upon channel spacing of the melt network. These include ultra-depleted patterns when the porosity is very small (<0.005 for an intergranular network with 2 mm grain radii) and patterns of relative LREE enrichment at moderate porosity (0.02-0.03).