

Seminar 3 (to follow Lecture 8)

“Partitioning of trace elements between crystals and melts”, by Blundy and Wood, Earth Planet. Sci. Letts., 210, 383-397, 2003; also see “Trace element partitioning under crustal and uppermost mantle conditions: the influences of ionic radius, cation charge, pressure and temperature”, by Wood and Blundy, Treatise on Geochemistry, Vol. 2, Chapter 9, pp. 395-424, 2003.

With advances in analytical techniques for determination of partition coefficients (D) for many elements in a single mineral/melt system N. Onuma recognized that D mineral/melt values vary systematically with ionic radii and oxidation state (see Onuma et al., EPSL, 5, 47-51, 1968).

However, more than 20 years elapsed before a theoretical model with predictive capability was developed. In a pioneering paper stimulated by Nagasawa (Trace element partition coefficient in ionic crystals, Science, 152, 767-769, 1966) and Brice (Some thermodynamic aspects of the growth of strained crystals, Jour. of Crystal Growth, 28, 249-253, 1975), Blundy and Wood (Prediction of crystal-melt partition coefficients from elastic models, Nature, 372, 452-454, 1994) presented a theoretical model based on ionic bonding with predictive capabilities. This paper was followed by a plethora of experimental papers on TE partitioning from the Blundy and Wood group (e.g., see Appendix 1 for Lecture 7) for a range of elements in several mineral/melt systems. These two review papers are excellent reviews and summary of the ionic-based model that has had great success in developing an understanding of the controls on TE partition coefficients.