Modeling microstructural disequilibria during generation of oceanic basalts

CHRISTOPHER J. GROSE AND JUAN CARLOS AFONSO[1]

[1]ARC Centre of Excellence for Core to Crust Fluid Systems, Department of Earth and Planetery Sciences, Macquarie University, North Ryde, Sydney, NSW 2109, Australia. christopher.grose@mq.edu.au

We have developed a two-dimensional numerical model of multi-phase coarsening, diffusive trace element partitioning, and near-fractional melting. The model is applied to the generation of melts in MORB and OIB sources, and results are compared to (and constrained by) density functions from a MORB database and age-dependent La/Sm and Sm/Yb systematics in OIB's. Our principal conclusions are: (1) OIB sources are dominantly cool (1300-1450°C), (2) OIB sources are not enriched in trace elements compared to MORB, (3) OIB source melting is a non-equilibrium process, and (4) effective partition coefficients for Samarium in the mantle source assemblage may be significantly different from recent experimental values. The figure below shows a typical prediction of our models around the garnet transition depth.