Olivine-melt partition coefficients for incompatible elements: data from melt inclusions study.

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We report partition coefficients of Al, Ti, Dy, Ho, Y, Er, Tm, Yb, Ca, Lu, Cu, and Sc between magnesian olivine and tholeiitic melt in the temperature range between 1190-1390C, 100 MPa pressure and oxygen fugacity close to QFM buffer. Coefficients were determined by LA-ICP MS and EPMA of melt inclusions and host olivines from Loihi Seamount and Mauna Loa volcano (Hawaii) and Detroit seamount (Emperor Seamounts). Only primary, glassy inclusions (naturally or laboratory quenched) of more than 80 micrometers in diameter were considered. Trapping temperatures were estimated by modeling of equilibrium between melt and host olivine. Compositions of inclusions were corrected for post-entrapment crystallization of olivine on the walls using the same technique.

The following average Kds olivine-melt were determined : Al -0.0042 (SD-0.0007), Dy – 0.0043 (SD-0.0005), Ti – 0.0069 (SD-0.0007), Ho – 0.007 (SD-0.001), Y – 0.007 (SD-0.001), Er – 0.010 (SD-0.002), Tm – 0.014 (SD-0.004), Yb – 0.022 (SD-0.004), Ca – 0.025 (SD-0.003), Lu – 0.032 (SD-0.004), Cu -0.090 (SD-0.047), Sc – 0.190 (SD-0.026).Where SD is standard deviation of mean. Kds for Al and Y show strong positive correlation with temperature:

$$\text{Kd Al} = 0.000014 * T^o C - 0.015;$$

$$\text{Kd Y} = 0.000013 * T^o C - 0.010.$$

The obtained data are similar to values reported in previous studies but significantly expand the range of compositions and elements.