

Trace element partition coefficients for mica and a variety of mantle-derived melts and fluids

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Partition coefficients (D_s) for up to 38 trace elements for phlogopitic mica at 2-3 GPa, 1025-1160 °C have been determined for 3 different mantle-derived melts (basanite, lamproite and carbonatite). Partitioning for mica/lamproite differs from the other 2 compositions. Thus Cs, Ba and V are mildly incompatible, Rb compatible and Cr strongly compatible in mica from lamproite, whereas for mica from carbonatite and basanite Cs, Ba and V are compatible and Rb and Cr are strongly compatible. REE and HFSE are incompatible for mica from all 3 compositions. Additional data, obtained for mica/basanite pairs only, shows that Ni is strongly compatible, Co and Tl moderately compatible, Zn, Ga and Ge moderately incompatible and U and Th strongly incompatible. The contrast in partitioning behaviour for mica from lamproite compared with mica from basanite and carbonatite is largely controlled by crystal chemical features (especially Al_{IV} , which is low in mica from lamproite). Thus choice of D_s in geochemical modeling of mantle melting or crystal fractionation processes involving phlogopitic mica must take into account the composition of the mica. Melt structural differences between carbonatitic and silicaundersaturated silicate melts do not appear to significantly affect mica/melt D_s . Comparing the D_s for phlogopite/basanite pairs with those for dioctahedral phengite/aqueous fluid pairs [1,2] shows similar behaviour except for Cs, which does not partition into phengite. Thus Cs/Rb and Cs/Ba ratios may provide discriminants for the micas involved.

References

- [1] Green T.H. and Adam J. (2003) *Eur.J.Min.* **15**, 815-830.
- [2] Melzer S. and Wunder B. (2000) *Geology* **28**, 583-586.