The Partitioning of Fluorine between Granitic Melt and Mn-rich Garnet

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As a potential monitor of fluorine concentration in evolved granitic liquids, the partitioning of F between garnet and peraluminous Mn-bearing granitic melt has been assessed by cold-seal experimental techniques and electron microprobe analysis. Garnets and glasses (melts) were synthesized from a mixture of minerals and reagents at 800°C, 200 MPa, and an $f(O_2)$ near NNO-0.5 log units. Relicts of garnets ($Sps_{95}Alm_5$ and $Alm_{46}Prp_{44}Sps_6Grs_4$) added as sources of Fe, Mg, and Mn have Sps-rich overgrowths. The average compositions of overgrowths on Alm-rich relicts are $Sps_{76}Alm_{12}Prp_{11}Grs_1$ and those on Sps-rich relicts are $Sps_{83}Alm_6Prp_{10}Grs_1$.

The partitioning of F between Grt-melt seems to be controlled by the Mn/Fe ratio of Grt and/or T-site deficiency. The average F content of new garnet is 0.57 wt.% (1σ=0.13) in overgrowths with X_{Sps}=0.83 and 0.46 wt.% (1σ=0.18) with X_{Sps}=0.76. The corresponding average F content of glass is 2.52 wt.% (1σ=0.10), yielding crystal/melt partition coefficients in the range of 0.18-0.23. Further experiments are being conducted to test the dependence on F concentration and temperature and to reduce the variability of F content among products.