TE and REE modeling of Central Anatolian Volcanics, Turkey

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For the past 10 years, we have collected and analyzed significant number of samples from Central Anatolian Volcanics (CAV) of Turkey to establish a working petrogenic model for the CAV complex. Samples are analyzed for major oxides, TE and REE. We also analyzed samples from Mont Serrat (rhyolite, 1997 eruption product) under the same condition for comparison. For rock classifications, magmatic origins, and tectonic environments we applied all currently used discriminant diagrams. In addition, we used all 26 Spider diagrams normalized to MORB, Chondrite, and PM where applicable. We computed P-T conditions from amphiboles and pyroxenes. Our field and lab data indicate that the CAV of basaltic andesite, andesite, dacite, and rhyolite appears to have gone several cycles of eruptions since Middle Miocene and continued through Quaternary. We applied all possible discriminant diagrams systematically to show that previously performed "plot and interpret" approach do not always tell the true petrogenetic processes. Our MELTS model supports our findings.

Crystal chemical controls on garnet partitioning of REE and HFSE

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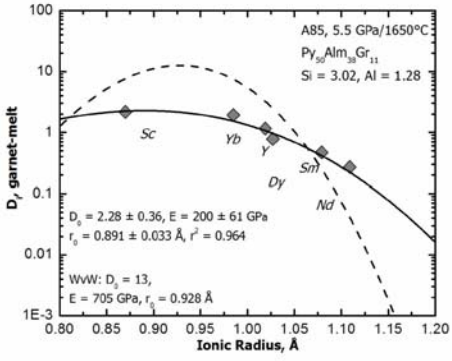
Garnets grown in Fe-rich liquids show significantly different trace element partitioning than do garnets from Mg-rich compositions [1-3]. Multi-anvil experiments have been performed at 5-7 GPa on a synthetic Apollo 14 Black glass composition to determine the controls on garnet paritioning. A14B is the most TiO_2-rich of the lunar picritic glasses (16.4 wt %) and contains 24.5 wt % FeO.

Experimental charges were analyzed for major and trace elements on the EPMA and SIMS, respectively. Garnets have compositions of $Py_{50-62}Alm_{30-39}Gr_{7-11}$ with ~2 wt % TiO_2 and ~4 wt % Cr_2O_3. The lattice strain model of [4] was applied to trivalent cation D-values measured from these experiments. There is a signifcant mismatch between the partitioning predicted by [5] and the D-values measured in this study, shown in Figure 1. These data will ultimately be used to extend the predictive model of [5] to account for Fe-rich compositions.



High field strength element D-values (Ti, Hf, Zr, and Th) were also treated with the lattice strain model and resulted in D_o = 0.603 ± 0.104, E = 191 ± 49 GPa, and r_o = 0.830 ± 0.014 Å (r^2 = 0.959). These results are provisional because these 4^+ cations do not cover a large enough range in ionic radii for the lattice strain model to accurately describe the partitioning.

References

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