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HYDROTHERMAL MINERALS FROM THE BARRA DO ITAPIRAPUÃ CARBONATITE, SOUTHERN BRAZIL, AND THE EVOLUTION OF THE MINERALIZING FLUIDS

ANDRADE, F. R. D. and RUBERTI, E. Instituto de Geociências – Universidade de São Paulo, São Paulo, Brazil.

The Barra do Itapirapuã carbonatite belongs to a Cretaceous province in southern Brazil, related to the opening of the South Atlantic, and is emplaced in a Proterozoic granite. The carbonatite is mainly composed of plutonic magnesio- and ferrocarbonatite and is host of a late- to post-magmatic hydrothermal REE mineralization. In the mineralized carbonatite, corrosion cavities in primary ankerite are filled with a hydrothermal mineral assemblage of quartz, apatite, fluorite, RE-fluorocarbonates, barite, sulfides and Fe-oxides in variable proportions. Two types of hydrothermally overprinted carbonatites have been identified, one strongly silicified and other enriched in apatite, and the highest REE contents of the massif are present in the former type. The REE composition of the fluorocarbonates depends on its paragenesis, as fluorocarbonate in silicified carbonatited has steeper REE patterns than in apatite-rich overprinted carbonatite. This may reflect the stability of REE complexes in the hydrothermal fluid. LREE form complexes preferentially with fluorine and carbonate, while HREE form stable complexes with phosphate, the latter being stable at lower temperatures. With decreasing temperature, LREE complexes destabilize first to form the LREE-enriched fluorocarbonates, as in the silicified carbonatite. At lower temperatures the HREE complexes destabilize and formed HREE-enriched fluorocarbonates and apatite, in the apatite-rich carbonatite. This is consistent with the straight positive correlation between HREE (Y) and P contents in whole rock samples. Hydrothermal apatite is similar to carbonatite derived apatites, with high Sr and REE contents. Therefore, combined analysis of hydrothermal minerals can provide a scenario of the chemical evolution of mineralizing fluids.

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