

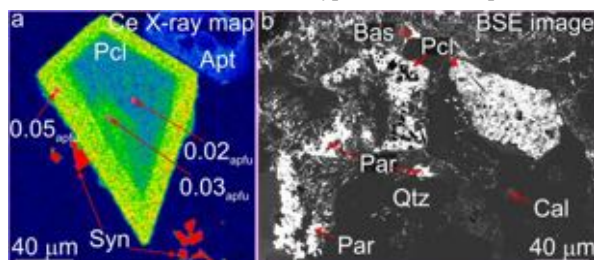
## Pyrochlore alteration and REE mineralization in the Amba Dongar carbonatite complex, India

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The sövitic rock in the Amba Dongar carbonatite complex is known for hydrothermal fluorite mineralization. The other rock types in the complex include alvikite, beforite, ankeritic carbonatite and fenite [1]. There is a high potential for REE mineralization resulting from the alteration of pyrochlore and formation of REE-bearing minerals. Abundant pyrochlore occurs in almost all the rock types in the complex and is



**Fig. 1.** Fresh pyrochlore grain associated with relatively less REE-mineralization (a) compared to abundant REE fluorcarbonates associated with altered pyrochlore grains (b).

associated with calcite, apatite, quartz, REE-fluorcarbonates, florencite, fluorite and barite. While the euhedral grains of pyrochlore are fresh, oscillatory-zoned and unaltered (Fig. 1a), the fractured grains show variable extents of alteration (Fig. 1b). There exists a direct correlation between the abundance of the REE-bearing minerals such as bastnäsite-(Ce), parisite-(Ce), synchysite-(Ce) and florencite-(Ce) with the degree of alteration of pyrochlores (Fig. 1). The unaltered pyrochlores contain 0.70–0.96 apfu F and < 0.20 pfu A-site vacancy. In comparison, the altered grains are low (0.03–0.87 apfu) in F, with 0.13–1.98 pfu A-site vacancies, along with 0.001–0.12 apfu Pb. Also, altered pyrochlores are extremely hydrated as evident from their low oxide total, which goes down to 67.73 wt. %. The unaltered pyrochlores are enriched in the REEs compared to their altered counterparts. A Cl-depleted, F-enriched and S-bearing post-magmatic hydrothermal fluid is indicated to have transported the REEs as  $\text{SO}_4^{2-}$  complexes. REE mineralization accompanied by the coprecipitation of fluorite and barite took place due to local acidity neutralization through the interaction of the fluid with the carbonates [2].

[1] Viladkar and Schidlowski (2000), *Gondwana Res.* **3**, 415–424, [2] Migdisov et. al. (2016), *Chem. Geol.* **439**, 13–42.