Hydrothermal alteration of alkaline leucogabbros from La Morena intrusion, Fuerteventura (Canary Islands, Spain)

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La Morena intrusion, located in the Western part of the Fuerteventura island, is composed of scarce pyroxenites, abundant olivine-gabbros and gabbros *sensu stricto* and plagioclase cumulates or leucogabbros. The latter show intergranular texture in which clinopyroxenes and iron-titanium oxides crystallize between large and long calcic plagioclase laths. Biotites and apatites appear later, as both magmatic and late minerals, together with accessory titanite contain 1 wt% Nb_2O_5 and 2 wt% ZrO_2.

Hydrothermal alteration is recognized mainly in the occurrence of chlorite replacing olivine, and in interstitial zones to the large plagioclase crystals, composed by an assemblage of albite, analcime and calcite, over which idiomorphic, 50-150 μm size, epidote grows. This epidote shows characteristic oscillatory zoning involving Al^{3+} and Fe^{3+} substitution. Although oscillatory zoned epidote is regarded as an unreliable indicator of the chemical and physical evolution of hydrothermal systems (Piccoli and Candela, 2002), the occurrence of oxide mineral grains showing magnetite-ilmenite exsolution bands allowed to establish a subsolidus (616 to 470ºC) progressive re-equilibration in the NiNiO oxygen buffer. This suggests, moderately reducing conditions at least for the last cooling stages of La Morena mafic alkaline intrusion.

Finally, the high concentrations in some rare elements (Nb, Zr) could open the way for a better understanding of strategic resources such as columbite-tantalite (Ta not analyzed).

Piccoli, P.M. and Candela, P.A. (2002) Apatite in igneous systems. In M.J. Kohn, J. Rakovan, and J.M. Hughes, (eds.), Phosphates, Geochemical, Geobiological and Materials Importance, 48, p. 255–292. Reviews in Mineralogy and Geochemistry, Mineralogical Society of America.