

Ti-rich Cr-spinel and Ni-Fe-Cu sulphides from the Hamutenha basic-ultrabasic intrusion (Cunene anorthosite complex, Angola)

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The Cunene complex is a large group of gabbro-anorthosite intrusions that covers an area of 15.000 km² between southern part of Angola and northern Namibia. Although ultrabasic rocks have not been found to date in the main anorthositic intrusion of the Cunene complex, a great number of small basic-ultrabasic bodies appear close to the west margin of the main intrusion.

This work is based in one of these Cunene associated basic-ultrabasic intrusions outcropping close to the Hamutenha village, and especially on the study of its Ti-rich Cr-spinel and Ni-Fe-Cu sulphides associated mineralization. Both appear as a disseminated mineralization included in the olivine and clinopyroxene grains from the dunites and olivinic gabbros situated at the centre part of the intrusion.

The Ti contents of the Cr-spinel of Hamutenha are very high, even up to 15.66 % of TiO₂, with an average value of 5.17%. On the other hand, the Cr-spinel contains abundant exsolutions of ilmenite lamellae. The ratio Cr₂O₃/Al₂O₃ in Cr-spinel presents a positive correlation. This is an atypical behaviour, because the typical tholeiitic magmas that generate this kind of intrusions use to display a negative correlation.

These aspects suggest that the parental magma of Hamutenha was relatively rich in Ti, and had a similar composition as the estimated magma for Mount Ayliff intrusion (Karoo Igneous Province, South Africa [1]; and Jinbaoshan (SW China [2]) and Xinjie (SW China [3]) intrusions in which appear associated mineralizations of Fe-Ti-Cr and Pt-Pd sulphides.

Although Ni-Cu ore deposits are currently explored in the Cunene complex, in the Hamutenha intrusion Ni-Fe-Cu sulphides have been found only as accessory minerals disseminated in dunites and olivine gabbros. The sulphides occur as interstitial grains, in inframillimetric size. Primary sulphides are pentlandite, chalcopyrite and pyrrhotite. The secondary association is complex, and consists of thiospinels, heazlewoodite (Ni₃S₂), godlevskite ((Ni,Fe)₇S₆) and putoranite (Cu₁₆₋₁₈(Fe,Ni)₁₈₋₁₉S₃₂).

[1] Cawthorn, R.G. et al. (1991) *Am. Mineral.* **76**, 561-573. [2] Wang, C.Y. et al. (2005) *Lithos* **83**, 47-66. [3] Wang, C.Y. (2008) *Lithos* **102**, 198-217.