

An unusual REE-Nb-Ta-bearing IOA deposit associated with carbonatite: insights from Gleibat Lafhouda, South Morocco

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Carbonatites are mainly associated with alkaline igneous rocks, but some occur in association with ultramafic Fe-P-rich rocks termed phoscorites possibly indicating a genetic relationship. A recent study in the Oulad Dlim massif of South Morocco revealed the first occurrence of a carbonatite and Iron-Oxide-Apatite (CarbIOA) assemblage which hosts significant REE-Nb-Ta mineralization in the Gleibat Lafhouda (GL) area. Preliminary results indicated an exploration tonnage target of ~49 million tons with mean compositions at 0.4% Nb₂O₅, 265 ppm Ta₂O₅, 508 ppm U₃O₈, 0.2% REE and 35% Fe₂O₃. Columbite-(Fe) is the main Nb-mineral and occurs closely associated with Fe-phases, whereas microlite and Ta-rich pyrochlore are mainly associated with coarse-grained apatites hosted by an Fe-oxides and silica breccia. Significant REE contents are hosted by Th-poor monazite-(Ce) which is usually associated with large apatite crystals. Although the processes leading to this mineralization with direct links to carbonatite are still poorly understood, geochemical characteristics and textural relationship suggest a genetic relationship and significant remobilization by late hydrothermal fluids at multiple stages. Furthermore, the GL CarbIOA represents a unique case study to test and ground-proof some of the more recent developments in IOA research and it serves as a system that can be compared to other carbonatite-Fe-P formations such as phoscorites. Understanding new types of the IOAs will significantly advance our understanding of their formation and will provide important information on the magmatic/hydrothermal evolution of this unusual CarbIOA occurrence and of the significant REE, Nb and Ta mineralization that is associated with it.

