# Chemical zoning and microtexture of magnetite from Los Colorados iron oxide-apatite deposit, Chile

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The Cretaceous Chilean Iron Belt comprises more than 40 iron oxide-apatite (IOA) "Kiruna-type" deposits that extend ~600 km along the Coastal Range of northen Chile and occur within the domain of the southernmost segment of the sinistral strike-slip Atacama Fault System. The origin of these massive magnetite ores remains controversial and fundamentally different formation processes have been suggested. These include liquid immiscibility, magmatic hydrothermal replacement, and hydrothermal precipitation in the sense of IOCG-type deposits.

Here we focus on the so far poorly studied magnetite chemistry of IOA orebodies in the Chilean Iron Belt. Back-scattered electron (BSE) imaging of samples from the Los Colorados deposit (~70 Mton Fe) shows that magnetite is characterized by complex textural features that are closely related to chemical composition, including oscillatory and sector zoning. Preliminary EMPA analyses and detailed wavelength-dispersive spectrometry (WDS) X-ray maps reveal that main-stage magnetite cores are rich in Ti, V, Al, and Mn (up to 0.9, 0.7, 0.9, and 0.3 wt. %, respectively). Concentrations of these elements decrease significantly from core to rim, with late-stage magnetite rims containing the lowest amounts of Ti, V, Al and Mn.

When plotted on (Ti+V) *vs*. (Ca+Al+Mn) [1] and (Ti+V) *vs*. (Al+Mn) [2] diagrams, the Los Colorados data show a decreasing (cooling) trend from high Ti-V-Al-Mn-bearing cores, similar to igneous magnetite from porphyry and Fe-Ti, V deposits, to lower Ti-V-Al-Mn rims that plot in the Kiruna field. These results strongly suggest that magnetite at Los Colorados records magmatic signatures that are locally overpinted by later events of hydrothermal alteration and remobilization.

[1] Dupuis and Boudoin (2011) *Miner. Deposita* **46**, 319-335.
[2] Nadoll *et al* (2014) Ore Geol. Rev. (in press).