Halogens, trace element concentrations, and Sr-Nd isotopes in apatite from iron oxide-apatite (IOA) deposits in the Chilean iron belt: Evidence for magmatic and hydrothermal stages of mineralization

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The ratio of the halogens F and Cl in apatite is highly sensitive to changes in the composition of an evolving silicate melt or aqueous fluid. For this reason apatite chemistry is widely used as a monitor of halogen behavior in magmatic-hydrothermal systems. Apatite is an ubiquitous mineral in iron oxide ? apatite (IOA) mineral deposits, where P and volatiles such as F, Cl, H2O and S play a major role in ore genesis. In this study, we present a combination of textural, micro-analytical and isotopic data for apatite from three Andean IOA deposits (Carmen, Fresia and Mariela) of Early Cretaceous age from the Coastal Cordillera of northern Chile. Apatite textures and compositions show evidence of post-crystallization alteration. Apatite is predominantly zoned with respect to Cl and F, showing a decoupled geochemical behavior between these two elements. Overall, four types of apatite or domains were identified in the analyzed grains based on the XCl-apatite/XF-apatite an