The geochemistry of apatite from the Los Colorados iron oxide?apatite deposit, Chile: implications for ore genesis

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Apatite grains from the Los Colorados iron oxide?apatite (IOA) deposit, the largest IOA deposit in the Chilean Iron Belt (CIB), exhibit significant intracrystalline spatial variability with respect to the concentrations of F, Cl, and OH and trace elements. Statistical interrogation of the compositional data indicates that individual apatite grains contain spatially discrete F-rich and Cl-rich domains. The chemical composition of the F-rich domains is consistent with apatite growth from silicate melts, whereas the chemical composition of the Cl-rich domains is consistent with apatite growth from a magmatic-hydrothermal fluid that cooled as it percolated outward from the Los Colorados fault?the structural control for emplacement of the ore body?into the surrounding brecciated diorite and andesite host rocks. Apatite in the deposit is intimately intergrown with magnetite and actinolite for which trace element, Fe, H, and O sta