

### **Deciphering the formation of Andean Iron Oxide-Copper-Gold Deposits: New Advances in their Geology and Exploration**

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Andean IOCG deposits form part of the Andean-Iron-Belt which extends from central Peru to central Chile and hosts world-class deposits such as Candelaria, Mantoverde, Mina Justa and Raúl-Condestable. Andean IOCG deposits formed between the Upper-Jurassic and Mid-Cretaceous at a convergent plate boundary at the end or just after back-arc extension related to steep subduction. These deposits correlate in time and space with IOA and stratabound Cu-Ag deposits and are mostly hosted in volcanic/volcanosedimentary sequences, although sometimes they can be hosted in shear zones within intrusions. Andean IOCG deposits have a strong structural control with both transtensional and transpressional environments, and in the Chilean section of the belt they have a close relationship with the Atacama Fault System. Mineralizing hydrothermal fluids are mostly characterized as magmatic-hydrothermal, although external fluids potentially from evaporites can occur at later stages of mineralization. Alteration facies in IOCG deposits are characterized by an early and widespread Na-Ca alteration, followed by Ca-Fe alteration that can form IOA mineralization in some cases, high-temperature Fe-K alteration that can form magnetite dominant IOCG mineralization (e.g. Candelaria) or low-temperature Fe-K that can form hematite dominant IOCG mineralization (e.g. Mantoverde), and later lower-temperature K-Si-Al  $\pm$  Fe-Ba alteration. Mineralization can be hosted in structures and in favorable lithologies, forming structurally controlled and/or lithologically controlled ore bodies. Copper mineralization is predominantly found as chalcopyrite, although in some cases bornite is also significant (e.g. Mina Justa/Raúl Condestable). The relationship between IOCG and magmatism is not direct, as these deposits are not hosted in intrusions that sourced mineralization, although magmatism coeval with IOCG mineralization is documented to show more oxidized conditions favorable for Cu mineralization. In contrast, magmatism coeval with early Ca-Fe alteration and IOA mineralization is documented to show more reduced conditions suggesting that overall conditions to form one deposit over the other are different.