

Mineralogical Constraints on the Mobilization and Mineralization of REEs in the Lala Fe-Cu Deposit, SW China

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The Lala Fe-Cu deposit in the northern Kangdian IOCG metallogenic province, SW China, has typical association of Fe-oxides, Cu-Mo-sulfides and REE minerals. REE minerals are dominated by monazite, parisite and bastnaesite with minor xenotime. They occur as inclusions in apatite, or as individual grains associated with Cu-Mo sulfides, fluorite, biotite and carbonates which postdate earlier magnetite and apatite. Monazite-bearing apatite grains have LREE, Na, Cl, Ba, Sr and La/Sm ratios much lower than monazite-free apatite grains. It is interpreted that REEs in apatite were metasomatically mobilized by late fluids from which Cu-Mo sulfides formed, and then re-precipitated monazite either within apatite or as grains associated with Cu-sulfides. Similarly, REEs of hosting altered volcanic rocks, as potential sources of REEs at Lala, were mobilized. Compositions of amphibole and

biotite and previous published data of fluids indicate that the fluids capable to mobilize and precipitate REEs were oxidized, F-CO₂-K-SO₄-rich with high K/Na, F/Cl and Mg/(Mg+Fe²⁺) ratios, from which sulfides have also deposited. Such fluids are different from earlier fluids from which magnetite and apatite formed. The earlier fluids had high salinity (NaCl up to 31wt.%) and low sulphate concentration. Chlorine, K and CO₂ in the fluids may have played an important role in mobilizing and transporting LREEs, whereas F and/or PO₄³⁻ and CO₃²⁻ were responsible for the deposition of REE minerals which occurred shortly after the mobilization of LREEs. The transition from NaCl-rich to more-oxidized, F-CO₂-K-SO₄-rich fluids is considered a significant process for REE mineralization in IOCG deposits.