Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.23412

# The behavior of chalcophile elements during the differentiation of two distinct magma series from the Central Andes

**KANG CHEN**[1], ZAICONG WANG[1] AND SUZANNE M KAY[2]

[1]China University of Geosciences (Wuhan)
[2]Cornell University

Presenting Author: kangchen@cug.edu.cn

Two distinct series of volcanic rocks from the Central Andes are investigated for chalcophile element concentrations in order to quantify their behavior during magma differentiation in a continental arc setting. One series of the samples (MgO between 9 and 2 wt. %) show slowly decreasing FeOT, constant FeOT/MnO, and increasing Sr/Y, La/Yb and Dy/Yb along with decreasing MgO, indicative of equilibration with a magnetite-free and garnet-bearing residue/cumulate (named "garnet-effect series" hereafter). Samples in the other series (MgO between 4 and 0 wt. %) reveal decreasing FeOT, $TiO_2$, V, FeOT/MnO, Sr/Y, and Dy/Yb and gently increasing La/Yb as differentiation proceeds, suggesting the fractionation of amphibole and magnetite (named "amphibole-effect series" hereafter). Sulfide saturation and fractionation occurred for the whole compositional ranges in both series as evidenced by the decreasing Cu concentrations and reducing Cu/Ag during differentiation. The decreasing Cu/Ag also suggest the fractionated sulfide phases are crystalline, not liquid sulfides. Additionally, the lower Cu/Ag in the most primitive samples (MgO = ~8 wt. %) from the garnet-effect series than in MORB imply that sulfides have saturated at very early stages during the differentiation of their parental magmas. By contrast, the high Cu concentrations (up to 70 ppm) in the most primitive samples (MgO = ~4 wt. %) from the amphibole-effect series imply that the more primitive magmas (MgO > 4 wt. %) are likely sulfide-undersaturated. We suggest that sulfide saturation in the garnet-effect series was caused by the high pressure and the depleted FeOT, both of which have negative effects on sulfur concentration at sulfide saturation. Sulfide fractionation in the amphibole series at MgO < 4 wt. % was probably triggered by magnetite (± amphibole) fractionation, which reduced the FeOT contents in the melts. The similarities in Cu concentrations and Cu/Ag ratios in between the garnet-effect series and the average continental crust suggest that early-stage sulfide fractionation and high-pressure differentiation in thick continental arcs are necessary processes for continental growth.