

## **Chalcophile element systematics in continental arc magmas as observed in the Central Andes**

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Two series of volcanic rocks from the Central Andes are investigated for chalcophile elements (Cu, Zn, Ga, Ge, Mo, Ag, Cd, In, Sn, Te, W, Tl, Pb and Bi) in order to quantify their behavior during magma differentiation in a continental arc setting. One series of the samples show slowly decreasing FeOT (total Fe) and increasing Sr/Y, Sm/Yb and Dy/Yb along with decreasing MgO, indicative of equilibration with a plagioclase-free, garnet-bearing residue (named “garnet-effect series” hereafter). Samples in the other series reveal rapidly diminishing FeOT, TiO<sub>2</sub> and V, and gently decreasing Dy/Yb as differentiation proceeds, suggesting the fractionation of amphibole and magnetite (named “amphibole-effect series” hereafter). Sulfide saturation occurred for the whole compositional ranges in both series as evidenced by the decreasing Cu concentrations and reducing Cu/Ag along with 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 from both series than in MORB imply that sulfides have saturated at very early stages during the differentiation of their parental magmas. We believe 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 (Smythe et al., 2017). By contrast, sulfide fractionation in the amphibole series was triggered probably by magnetite fractionation, which scavenged the FeOT and reduced redox condition in the magma (Jenner et al., 2010; Jugo et al., 2010). Sn, W, Tl, Pb and Bi, which are nominally chalcophile elements, show incompatible behavior, whereas Cd and In are compatible, during the differentiation of both magma series.

### References

Jenner et al., 2010. *J. Petrol.* 51 (12) 2445-2464. Jugo et al., 2010. *Geochim. Cosmochim. Acta* 74 (20) 5926-5938. Smythe et al., 2017. *Am. Mineral.* 102 (4) 795-803.