

Bulk-rock Os isotopic data of chromitites vs. in-situ Os isotope measurements on PGM: new data from the Falcondo Ni-laterite deposit, Dominican Republic

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Osmium isotopic compositions provide insights into the interaction between Earth's interior regions. Os isotope compositions measured in-situ in platinum-group elements (PGE) bearing minerals or as bulk analyses from PGE-bearing host rocks serve as key indicator of these geological processes. This contribution presents preliminary whole-rock osmium isotope data from three chromitite samples collected from Loma Peguera, Loma Cumpié, and Loma Larga in the Falcondo Ni-laterite deposit, Dominican Republic. These samples exhibit high PGE contents (up to 13,712 ppb) and have been previously attributed to magmatic (Loma Peguera), hydrothermal (Loma Cumpié) and supergene (Loma Larga) origins.

The measured bulk-rock $^{187}\text{Os}/^{188}\text{Os}$ ratios are 0.1241 ± 0.0006 (2σ uncertainty) for Loma Peguera chromitite, $0.1241\text{--}0.1247 \pm 0.0006$ for Loma Cumpié chromitite, and 0.1248 ± 0.0006 for Loma Larga chromitite. Notably, all these values fall within the range of present-day mantle materials (0.1290 ; [1]), suggesting a primary magmatic signature. These results suggest that post-magmatic processes have not significantly modified the bulk-rock Os isotopic ratios. However, these values are not in agreement with a previous study [2] that reported distinct $^{187}\text{Os}/^{188}\text{Os}$ ratios for two populations of Os-rich PGM in the Falcondo Ni-laterite deposit: i) Hypogene PGM, interpreted as magmatic and hydrothermal phases (i.e. laurite (RuS_2), and Ru-Os-Mg-Si phases), with $^{187}\text{Os}/^{188}\text{Os}$ ratios ranging from 0.11973 to 0.12215 . ii) Supergene PGM, interpreted (trans-)formed during advanced lateritization (i.e. ruthenian hexaferrum (RuOsIrFe) and Ru-Os-Fe alloys) with $^{187}\text{Os}/^{188}\text{Os}$ ratios ranging from 0.12390 to 0.12645 . The variations in $^{187}\text{Os}/^{188}\text{Os}$ ratios observed in supergene PGM were attributed to the opening of the isotopic system during supergene processes. In view of these observations, further studies should focus on specific Os-rich PGM grains within the studied chromitites to directly compare their Os isotopic ratios with those of the bulk-rock, assessing potential disturbances in the Os system.

References

- [1] Walker, R.J., Horan, M.F., Morgan, J.W., Becker, H., Grossman, J.N., Rubin, A.E., 2002. Comparative ^{187}Re – ^{187}Os systematics of chondrites. *Geochimica et Cosmochimica Acta* 66, 4187–4201.
- [2] Aiglsperger, T., González-Jiménez, J.M., Proenza, J.A., Galí, S., Longo, F., Griffin, W.L., O'Reilly, S.Y., 2021. Open