

Investigation on the age of mineralization in the Sungun porphyry Cu-Mo deposit, NW Iran with a regional metallogenic perspective

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The Sungun porphyry copper deposit (PCD) is located in NW Iran, neighbouring several other PCDs and prospects in the region and the Lesser Caucasus (south Armenia). It lies on the Urumieh-Dokhtar magmatic arc (UDMA), which formed through the northeast-ward subduction of the Neo-Tethyan oceanic crust beneath the Central Iranian plate during late-Mesozoic and early-Cenozoic [1], and hosts the porphyry copper metallogenic belt of Iran. The Sungun PCD is the second largest deposit in Iran with ore reserves of about 850 Mt at 0.62 wt% Cu and 0.01 wt% Mo and probable reserves over 1Gt.

The monzonitic to quartz monzonitic porphyry stock intruded the upper Cretaceous carbonates and Eocene volcano-sedimentary rocks. It produced a skarn-type mineralization at its contact zone with the carbonate rocks, as well as vast hydrothermal alteration zones and porphyry-type Cu and Mo mineralization. The zircon U-Pb age of the host porphyry stock is about 22.5 ± 0.4 to 20.1 ± 0.4 Ma [2].

Re-Os dating of four molybdenite separates from this PCD shows ages ranging between 22.9 ± 0.2 to 21.7 ± 0.2 Ma, with an average of 22.57 ± 0.2 Ma, corresponding to the early Miocene (Aquitania). These ages indicate that both the porphyry stock and the Cu-Mo mineralization are post-collisional events, similar to many other deposits and prospects in NW and central Iran and south Armenia, and the mineralization occurred shortly after the emplacement of the host stock, corresponding better to the ages obtained from the marginal parts of the stock. Magmatism and mineralization in Sungun coincides with the third metallogenic epoch in the Lesser Caucasus (Eocene to Miocene; [3]), though it is considerably younger than all of the dated PCDs and prospects in the south Armenia. It also postdates Cu-Mo mineralizations in the Saheb Divan (35 Ma), Qaradagh batholith (31.22 ± 0.28 to 25.19 ± 0.19 Ma), as well as Haft Cheshmeh PCD (28.18 ± 0.42 to 27.05 ± 0.37 Ma) in NW Iran, while it seems to be coeval with the Kighal, Masjed Daghi and Niaz deposits and prospects (20-22 Ma). In this regard and considering the available age data, this event can be considered as the third Cu-Mo metallogenic epoch in NW Iran.

Meanwhile, mineralization in Sungun is older than all the porphyry Cu-Mo mineralization across the central and SE parts of UDMA (except for Bondar Hanza PCD in Kerman zone with the age of 28.71 ± 0.46 to 28.06 ± 0.47 Ma [2]). Therefore, these ages indicate that collision between the Arabian and Iranian plates was disynchronous, being earlier in NW Iran and later in SE Iran, which can be resulted from the oblique convergence of the plates.

References

- [1] Berberian, M. and King, GCP. (1981). Towards a paleogeography and tectonic evolution of Iran. *Canadian Journal of Earth Sciences*, 18, 210-265.
- [2] Aghazadeh, M. et al. (2015). Temporal-spatial distribution and tectonic setting of porphyry copper deposits in Iran: constraints from zircon U-Pb and molybdenite Re-Os geochronology. *Ore Geology Reviews*, 70, 385-406.
- [3] Moritz, R. et al. (2012). Diversity of geodynamic settings during Cu, Au and Mo ore formation in the Lesser Caucasus: New age Constraints. *Proceedings of 1st Triennial EMC Meeting, Frankfurt, Germany.*