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How did magmatic and mineralizing processes in the Gangdese Paleocene-Eocene deposits respond to the India-Asia continental collision?

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The Gangdese metallogenic belt (Tibet, China) primarily hosts collision-related deposits associated with Tibetan tectonic evolution. The petrogenesis of Miocene porphyry Cu-Mo deposits in a post-collisional environment is widely investigated. Recently, more Paleocene-Eocene ore deposits associated with granitic stocks have been reported, which provides good examples to decipher the detailed magmatic and mineralizing processes related to the India-Asia continental collision (65-40 Ma). Thus, we present analyze the stress status from the Eocene Sharang porphyry vein formation and present the geochemical and isotopic compositions of magmatism in the Yaguila-Sharang ore district to constrain this connection.

The Yaguila skarn Pb-Zn-Ag (-Mo) deposit (10.5 Mt ore at an average grade of 4.25% Pb, 2.15% Zn, and 95.35 g/t Ag) is hosted in the hosted in the NW dipping Upper Carboniferous-Lower Permian Laigu Formation and early Cretaceous rhyolitic rocks. Skarn-type Pb-Zn ore and porphyry-type Mo mineralization are related to the emplacement of late Cretaceous-Paleocene granite porphyry (66.8 Ma), followed by Paleocene porphyritic biotite granite (60.9 Ma) and Miocene dyke of granodiorite porphyry. The Sharang porphyry Mo deposit (0.63 Mt metal molybdenum) is mainly hosted in the plutonic complex, emplaced into the Upper Permian Mengla Formation. The complex contains: Unit 1, pre-ore quartz monzonite and quartz diorite rocks (56.1-53 Ma); Unit 2, ore-related rocks (52.9-51.6 Ma), consists of porphyritic granite, granite and fine-grain granite porphyries and associated magmatic-hydrothermal breccia pipes, with molybdenite mineralization at 52.3 Ma, and Unit 3, post-ore Miocene dykes. The syn-ore E-W striking faults and the post-ore north-south trending faults set up the main structures framing the Sharang deposit.

The 32 types of hydrothermal veins at Sharang deposit have been carefully identified in three different stages. Applying vector analysis and failure-mode diagram in the analysis of vein orientation, we summarize the possible sub-horizontal, NNE-oriented largest principle stress direction $\sigma 1$ is dominated during the formation of pre- and main-mineralization veins. This is consistent with the Sharang syn-ore E-W reverse faults, indicating the regional north-south compressional stress, probably related to the continental collision, plays a significant role in the vein formation

Geochemical signatures and Nd-Hf isotopic compositions indicate that the Yaguila Cretaceous rhyolitic rocks were formed by the melting of ancient continental crust, whereas the Paleocene causative granite porphyry may have resulted from the interaction between mantle-derived and crustal-derived materials when continental collision was initiated. The dramatic increase of $\varepsilon Nd(t)$ values between emplacement of the granite porphyry and later biotite granite suggests a greater involvement of mantle materials. The Sharang causative porphyry are characterized by lower $\varepsilon Hf(t)$ and $\varepsilon Nd(t)$ values than those of the pre-ore rocks, which suggests that the Lhasa

terrane basement might play an important role in the formation of Sharang ore-forming intrusions. The post-ore Miocene dykes in the district might be generated from melting of enriched lithospheric mantle. Nd-Hf mixing calculations indicate an increasing contribution of mantle materials in Paleocene to Eocene intrusions, consistent with the regional tectonic model of Neo-Tethyan oceanic slab roll-back and break-off in the duration of initial continental collision.