Origin of Fe-oxide-Cu-Au-Mo deposits and response to convergent event of Rodinia, Southwest China

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The Kangdian basement of the Yangtze craton hosts large scale Cu-Au-Mo deposits along its western margin, among which La-La deposit is the most significant. The deposit is typical of iron-oxide-Cu-Au-(U-REE) deposit, which was originally categorized to VHMS[1]. The host rocks of the deposits are Proterozoic metamorphic rocks. Three types of alteration assemblages are associate with the Cu-Au-Mo-U-REE mineralization: (1) magnetite (I) + REE – bearing-apatite ± pyrrhotite (MRT); (2) chalcopyrite (I) + magnetite (II) + molybdenite + purple fluorite + ankerite ± pyrite ± cobaltite ± quartz ±biotite(II) ± garnet(II) ± sericite (CMMF); (3) dolomite / calcite + chalcopyrite ± quartz(CC). Significant Cu-Au-Mo mineralization is associated with the relatively oxidized and lower temperature stage (CMMF). Temperatures of CMMF are 250 ~ 330ºC. The element association of the deposits is Cu-Mo-Co-Au-Ag- U -REE -magnetite.

δS^{34} of sulifides are 3~4‰. ^{18}O and δD are -1.2 ~ 11.49‰ and -21.62 ~ -80‰, respectively. It is suggested that the deposits are originated from metamorphic hydrothermal fluids. The metamorphism age of the host rocks of the deposits is 1000Ma of whole rock Rb-Sr dating[2] , and Re-Os dating of molybdenite from four samples of ore yields dates of 983±1~1005±1Ma.

The metamorphism of the Kangdian basement rocks along the western margin of Yangtze craton is the result of the convergent event (1000Ma) of super-continent Rodinia[3], which corresponds with the age of the ore mineralization. Therefore, the Cu-Au-Mo mineralization hosted in the Kangdian basement is considered as the response to convergent event of super-continent Rodinia. This also implies that Kangdian basement has the potential of hosting giant Fe-oxide-Cu-Au deposits.

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Proterozoic mantle lithosphere beneath the extended margin of the South China block: In situ Re-Os evidence

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The Os isotope compositions of sulfides in mantle xenoliths from the Penghu Islands, Taiwan Strait, reveal the presence of Proterozoic subcontinental lithospheric mantle (SCLM) beneath the highly extended southeast margin of the South China block. These sulfides have recently undergone three types of disturbance in their Os isotope systematics: (1) addition of Re with no apparent addition of Os, or with only lithospheric Os with low $^{187}Os/^{188}Os$ ratios; (2) addition of Re, and of Os with an isotope composition near the present-day PUM; (3) addition of radiogenic Os, but little or no Re. The highly radiogenic Os in disturbance type 3 could be derived from lithospheric sources such as pyroxenites or subducted basalts, and the transporting medium may have been an oxidizing fluid derived from the Mesozoic subducting slab beneath the area. Despite the Os disturbance, T_{RD} model ages of sulfieds provide minimum estimates for the age of the SCLM. Both T_{RD} model ages for individual sulfides and model ages estimated from the initial $^{187}Os/^{188}Os$ ratios of Re-Os mixing lines require that some volumes of the SCLM formed prior to 2.3–1.9 Ga. Later events in the SCLM may be recorded by T_{RD} model ages of 1.5–1.2 Ga and ca. 0.9 Ga. The events recognized in the SCLM are consistent with those known in the crust of the mainland South China block. The sulfide Os isotope data show that Proterozoic lithosphere beneath the South China block has survived the extensive Mesozoic Yanshanian magmatism on the continental margin and has not been delaminated even during the severe lithospheric extension that led to the subsidence of the Taiwan Strait.

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