Research on chronology and formation mechanism of Xiaorequanzi Cu-Zn field in Tianshan Orogenic Belt, Western China

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A large number of VHMS deposits have developed within Tianshan orogenic belt in western China, and Xiaorequanzi Cu-Zn field, consisting of several sulphide deposits, is more typical. There are three perspectives on the genesis of the deposit. First, according to the phenomena that intermediate-acid porphyry veins usually emerge near the ore body, the copper amount of porphyries is several times higher than the Clarke value of similar rocks, it is a porphyry copper deposit. Second, based on the features that the deposit occurs in the Xiaorequanzi volcanic rocks, ore body is layered and like-layered, it is a VHMS deposit. Third, on the basis of the traits that oxide ores in the surface and deep primary ores are more veins, it is volcanic hydrothermal-type deposit.

In order to identify the mineralization age and genesis of Xiaorequanzi Cu-Zn deposit, the metallogenetic and magmatic events in mining area were systematically researched by Rb-Sr isotopic geochronology. The whole-rock Rb-Sr isochron age of ore-bearing rocks, andesite, is 313Ma; the Rb-Sr isochron age of quartz fluid inclusion in copper-bearing quartz veinlets is 297Ma; the age of albite porphyry is 267Ma; the Rb-Sr isochron age of quartz fluid inclusion in stockwork copper ore, which formed in the period of magmatic hydrothermal, is 264 Ma. Isotopic dating results show that Xiaorequanzi Cu-Zn field belongs to the composite deposit, consisting of volcanic exhalation sedimentation and post-magmatic hydrothermal reworking. The mineralization should be divided into two phases: the main occurred in the late Carboniferous, 313~297Ma, which is consistent with the time of volcanic eruptions. Superimposed mineralization of the late magmatic hydrothermal occurs in the middle to late Permian, about 264Ma, which is roughly the same as the emplacement time of subvolcanic rocks in the region.

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Mineralogic and climatic interpretations of the Late Miocene-Pliocene Red Clay Formation on the Chinese Loess Plateau

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The closest past analog to the contemporary global warming is the Pliocene. Its climate reconstruction has been focused on continuous sedimentary records and terrestrial eolian deposits. The late Miocene-Pliocene Red Clay Formation on the Chinese Loess Plateau is among the best archives of the Pliocene paleoclimate change. In this study, we examined three classic Red Clay profiles at Lingtai, Duanjiapo and Bajiazui on the Chinese Loess Plateau with X-ray diffraction, Fourier transform infrared spectroscopy, diffuse reflectance spectrophotometer and scanning electron microscopy. Compared to the overlying Pleistocene loess-paleosol sequences, the Red Clay profiles show the following different mineralogical features: (1) carbonates are composed of both calcite and protodolomite; (2) the protodolomite are rhombic euhedral crystals growing in soil voids and coexisting with secondary calcite and palygorskite; (3) smectite is one of the dominate clay minerals; (4) the hematite/goethite (Hm/Gt) ratio varies from 0.30 to 0.52, and is much higher than that of Quaternary loess and paleosol. The occurrences of protodolomite and palygorskite as well as abundant hematite and smectite in the Red Clay sequence may indicate that it was formed under a prevailing warm and dry climate condition, which is probably a response of the inner Asia continent to the Pacific permanent El Niño and global high temperature climate in the late Miocene to Pliocene.