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青海东昆仑卡尔却卡地区野拉塞铜矿床成因类型及成矿机制

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摘要：

青海野拉塞铜矿位于东昆仑造山带西段,是近年来祁曼塔格地区新发现的热液铜矿床,规模已达中型。矿床的容矿围岩主要是印支早期中酸性侵入岩,其次是志留纪滩间山群大理岩和基性火山岩。矿化主要受NWW向断裂构造控制,主要蚀变为硅化、绢云母化和钾长石化。根据脉体穿切关系和矿物交代关系,成矿过程划分为主要的Ⅰ、Ⅱ和Ⅲ个阶段。研究表明,野拉塞铜矿床石英中发育气液两相(W型)、含子矿物三相(S型)和富CO_2三相(C型)3种类型包裹体。流体盐度为3.42%~65.48% NaCleqv,集中在40.00%~55.00% NaCleqv和4.00%~10.00% NaCleqv两个区间;流体盐度、密度在直方图上主要表现为双峰特征。流体密度为0.43~1.25g·cm^{-3},集中在1.07~1.14g·cm^{-3}和0.55~0.85g·cm^{-3}两个区间。成矿温度为187~579℃,成矿Ⅰ、Ⅱ和Ⅲ阶段成矿温度分别为332~579℃、294~345℃和187~212℃。成矿Ⅰ阶段C型与S型包裹体共存,表明该阶段发生过沸腾或不混溶。可能的流体演化机制是,岩浆结晶的最后阶段从岩浆中直接出溶的极高温、中高盐度(约为15%~25% NaCleqv)的原始成矿流体(岩浆流体),通过不混溶作用形成高温高盐度S型、高温低盐度C型和高温低盐度W型流体,该过程导致成矿物质的第1次沉淀富集。成矿Ⅱ阶段流体的混合作用则是铜沉淀的主要原因。通过等容线图解法估算成矿压力为47.4~93.1MPa,成矿深度为1.8~3.5km。与成矿关系密切的酸性侵入岩类为高钾、铝过饱和的钙碱性系列岩石。岩石的稀土总量TREE为133.9×10^{-6}~240.6×10^{-6},介于上、下地壳平均值之间,岩石轻稀土分馏明显,重稀土分馏不明显,δEu为负异常。岩石具明显的K、Rb、Th等正异常,亏损重稀土,显示Nb、Ta负异常,尤其亏损P、Ti,与碰撞带岩浆岩地球化学特征类似。在Rb-Y+Nb和Nb-Y构造环境判别图解上,样品均落在同碰撞花岗岩区,成矿作用发生在早印支后期陆内强烈的造山时期。矿床成因类型为受线性断裂构造控制的似斑岩型矿床。

英文摘要：

The Yelasai copper deposit, Qinghai Province, is located in the west of eastern Kunlun orogenic belt. It is a newly discovered, medium-sized copper deposit in the Qimantage area. The major host rocks are the intermediate acid intrusive rocks of Early Indosinian, the minors are marble and basic volcanic rocks of Tanjianshan Group. Mineralization is controlled by NWW-striking faults, showing hydrothermal alteration of silicification, sericitization and potash feldspathization. According to the crosscutting relationships of the vein bodies and mineral replacement, the ore-forming process can be divided into three stages: Stage Ⅰ, Ⅱ and Ⅲ. Research on fluid inclusions shows that: fluid inclusion types of ore-bearing quartzes can be further classified into three subtypes: Aqueous and gas two-phase (W-type), daughter mineral-bearing three-phase (S-type) and CO_2-rich three-phase (C-type). The salinity of hydrothermal fluid is 3.42%~65.48% NaCleqv, mainly concentrated in 40.00%~55.00% NaCleqv and 4.00%~10.00% NaCleqv. The density is 0.43~1.25g·cm^{-3}, concentrated in 1.07~1.14g·cm^{-3} and 0.55~0.85g·cm^{-3}, both of them show two peaks on the histogram. The whole range of mineralization temperature is 187~579℃, whereas temperature in stage Ⅰ, Ⅱ and Ⅲ is 332~579℃, 294~345℃, 187~212℃, respectively. Coexisting of C-type and S-type inclusions in stage Ⅰ indicates fluid-boiling or immiscibility. Possible fluid evolution is as follows: The original magmatic ore-forming fluids, extremely high temperature, medium to high salinity (about 15%~25% NaCleqv), directly exsolve from a melt in the final stage of magma crystallization and partition into immiscible S-type(high salinity)and low salinity C-type and low salinity W-type fluids, which are trapped at high temperature. Fluid-boiling or immiscibility during stage Ⅰ causes ore precipitation for the first time, while fluid-mixing during stage Ⅱ plays an important role in Cu deposition. Mineralization pressure is about 47.4~93.1MPa, estimated by isochore graphic method, and the depth is 1.8~3.5km. The acid intrusive rocks, closely associated with mineralization, belong to high potassium, peraluminous calc alkaline series. The contents of REE range in 13

3.9×10^{-6}~240.6×10^{-6}, between the average of upper curst and that of the lower crust, LREE fractionation is significant while HREE fractionation is not, negative δEu anomalies are evident. The features in HREE loss, K, Rb, Th positive anomalies and Nb, Ta negative anomalies, particularly P, Ti loss, share similar features with the granites in collision belt in the terms of geochemistry. In the Rb-Y+Nb and Nb-Y diagrams, all samples fall in syn-collision granite field. Genetic type of Yelasai copper deposit is porphyry-like copper deposit under the control of linear faults, mineralization occurs during the intensive intracontinent orogenic period in the late stage of Early Indosinian.

关键词：流体包裹体 同碰撞环境 似斑岩型铜矿 野拉塞 东昆仑

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