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力马河镍矿Re-Os同位素研究

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摘要：

四川力马河镍矿是峨眉山大火成岩省一个重要的岩浆硫化物矿床。本文通过对其主要岩、矿石类型Re、Os及其同位素组成的分析，综合探讨了成矿岩体原始岩浆性质、矿石硫化物成因、成矿机制及Re-Os同位素等时线年龄。结果表明，力马河镍矿不同类型岩矿石样品初始Os同位素组成是不均一的，富硫化物的网脉状矿石及其选纯硫化物Os同位素组成初值差异较小，其等时线年龄为265±35 Ma、与岩体锆石SHRIMP年龄263±3 Ma基本相当；硫化物含量较低的岩、矿石样品间初始Os同位素组成差异较大，其表观等时线年龄大于成矿年龄。分析认为，岩矿样品初始Os同位素组成的不均一是由含较高放射成因187Os丰度的硫化物熔体和含较低放射成因187Os丰度的硅酸盐熔体不同比例混合造成的。混合模型分析表明，硫化物含量超过30%的矿石样品初始187Os/188Os基本接近，硫化物含量低于30%的岩矿石样品初始187Os/188Os随硫化物含量上的不同差异很大，为岩浆硫化物矿床Re-Os等时线年龄可能出现多组年龄解的现象提供了一种可能的解释。成矿岩体中含放射成因187Os丰度最低的岩石样品γOs（t=260Ma）在5左右、Cu/Pd比值在7000左右，表明是基本没有受到地壳混染及硫化物熔离影响的原始岩浆结晶分异产物，估计原始岩浆Os含量在1×10－9左右，为苦橄质岩浆。矿石硫化物Re/Os比值显著高于任何赋矿橄榄岩，γOs（t=260Ma）高达110左右，综合分析揭示了力马河镍矿硫化物为二次熔离成因，模式分析认为，矿石硫化物是由原始岩浆经历R=2000左右的硫化物熔离后、其亏损岩浆再经R=200左右的硫化物熔离形成，与二次熔离相对应，成矿岩浆也经历了两次混染作用，分别为上、下地壳7%左右的混染。

关键词：Re-Os同位素 等时线年龄 岩浆硫化物矿床 峨眉山大火成岩省 力马河镍矿

Re－Os isotope study on the Limahe nickle deposit

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Abstract:

The Limahe Nickel Deposit is a typical PGE-poor Ni-Cu deposit in the Emeishan Large Igneous Province. In this paper, various kind of ore and rocks from the Limahe nickel deposit were analyzed for their Re, Os concentration and Os isotopic composition. The intrusion is heterogeneity in the initial Os isotopic composition, and does not give an unified isochron. Sulfide rich ore and their separated sulfide have higher initial radiogenic Os isotopic compositions and little difference between each other , γOs (t=260Ma) ranges from 100 to 120 and plots a Re－Os isochron corresponding to an age of 265±35 Ma, which is agreement with previous zircon SHRIMP data age of 263 ±3 Ma in the main. Peridotites and sulfide poor ore are less initial radiogenic Os. One kind of peridotite is nearly uncontaminated with values of γOs (t=260Ma) in about 5 and a less contaminated peridotite is in about 29. While the disseminated ore have initial Os isotopic composition between the sulfide rich ore and peridotites. The barren rocks and sulfide poor ore constitute a pseudo isochron with a steeper regression for their difference in initial Os isotopic composition. The isotopic variations indicate mixing of multiple components in the forming of the ore, which means that high radiogenic Os sulfides mix with less radiogenic Os magma in the staging chamber. The Cu/Pd shows the uncontaminated peridotite is primary magma origin with no sulfide segregation, by estimating, the primary magma is high in Os content in about 1 ppb, indicating it belongs to picritic magma from high degrees of partial melting. The ore sulfides have high Re/Os ratio and high initial radiogenic Os isotope compositions, the Re/Os ratio is higher than any wall-rock peridotite and estimated composition of the primary magma, all these indicate the sulfides are originated from a daughter magma that had previous sulfides segregation in the depth. Model analysis shows two stages of comtamination in lower and upper crust in proportion of about 7% each stage, in accordance with two stages of sulfide segregation.

Keywords:Re-Os isotope isochron magmatic sulfide deposit Emeishan Large Igneous Province Limahe nickel deposit

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