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新疆磁海铁(钴)矿区镁铁质岩锆石U-Pb年龄、Hf同位素特征及岩石成因

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摘要：

磁海铁（钴）矿床是北山地区一大型富钴铁矿床，矿体产于辉绿岩中。矿区出露有大量的辉长岩。本文利用锆石LA-ICP-MS定年法，获得磁海矿区角闪辉长岩和磁南矿区粗晶辉长岩的$^{206}Pb/^{238}U$年龄分别为294.8±1.3Ma和276.1±0.63Ma，表明它们属早二叠世岩浆活动的产物。地球化学特征上，角闪辉长岩与辉绿岩为同源岩浆演化的产物，它们具有中等偏低的$Mg^{\#}$值（49~66）和相对高的TiO_2含量（2.27%~2.57%），属钙碱性和拉斑玄武岩系列（$FeO^T/MgO=0.93~1.84$），其微量元素显示富集大离子亲石元素（LILE）和轻稀土元素（LREE），亏损Nb、Ta和Ti，并具明显的Eu负异常。粗晶辉长岩与前者具有不同特征，它们有高的$Mg^{\#}$值（72~81）和低的TiO_2含量（0.24%~0.39%），属钙碱性玄武岩系列，具有富集大离子亲石元素Ba、Th、U、Pb、Sr和轻稀土元素（LREE），亏损Nb、Zr、Hf和P，并具明显的Eu正异常特征。角闪辉长岩和粗晶辉长岩具有正的$\varepsilon_{Hf}(t)$值（分别为4.6~11.7和1.5~5.1）。与北山地区同时代的具铜镍矿化的镁铁-超镁铁岩具有相同的特征。因此，认为磁海铁矿区基性岩形成于后碰撞伸展背景，由亏损的软流圈地幔熔体与俯冲板片物质的混合物。不同类型的岩石系不同成分的原始岩浆经不同演化过程的产物。

英文摘要：

The giant Cihai Fe (-Co) deposit is located in the Beishan area, the northern margin of the Tarim craton. The diabases are the main host rocks for the Fe (-Co) orebodies. Numerous gabbros are exposed in association with diabases. In this paper, we present LA-ICP-MS zircon U-Pb geochronology and Hf isotopic data of gabbros and the geochemical data of gabbros and diabases. Two mafic intrusions, one hornblende gabbro and one coarse-grain gabbro, have different ages of 294.8±1.3Ma and 276.1±0.63Ma, which is consistent with the age of mafic-ultramafic complex in Beishan area. Gabbros and diabase are calalkalic and tholeiitic series in composition, respectively. The hornblende gabbros and diabase have TiO_2 concentrations ranging from 2.27% to 2.57% and show enrichment of Ba, Th and U and depletion of Nb, Ta and Ti with negative Eu anomaly ($\delta Eu=0.64~0.77$ and $0.77~0.85$). The coarse-grain gabbros have TiO_2 concentrations ranging from 0.24% to 0.39% and show enrichment of U, Pb and Sr and depletion of Nb, Zr, Hf and P with positive Eu anomaly ($\delta Eu=1.2~3.8$). All the mafic intrusions in the Cihai iron deposit area exhibit elemental features generally comparable with those of the synchronous mafic-ultramafic intrusions in the Beishan region. The primary magmas may have been derived from asthenosphere mantle and mantle wedge metasomatized by fluids and melts released from the subducted slab. The different rocks (e.g. hornblende gabbros, diabase and coarse-grain gabbros) were likely resulted from different primary magma contents and differentiated during the cooling of magmas. Both primary magmas of gabbros and diabase experienced fractional crystallization of clinopyroxene, plagioclase, amphibole and minor Fe-Ti oxide. The hornblende gabbros and diabase were formed by residual magma, while the coarse-grain gabbros were likely resulted from the olivine-and plagioclase-laden crystal mush.

关键词：锆石U-Pb年龄 Hf同位素 镁铁质岩 岩石成因 新疆磁海

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