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西藏措勤尼雄岩体的岩石成因及其对富Fe成矿作用的潜在意义

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摘要：

西藏措勤尼雄岩体是冈底斯造山带白垩纪大规模酸性岩浆活动的代表之一，著名的尼雄富铁矿体就主要赋存在发育闪长质包体的尼雄岩体外接触带上。因此要探讨此富铁矿体的成因机制，就需要对邻近的尼雄岩体进行研究。本文报道了尼雄岩体的寄主岩石(~116Ma和~110Ma)和闪长质包体(~110Ma)的岩石学、全岩主量、微量元素和Sr-Nd同位素数据，以约束其岩石成因，并通过与南美智利安第斯铁成矿作用的对比，初步探讨了尼雄岩浆活动与富铁成矿作用的可能联系。尼雄岩体寄主岩石富硅(SiO_2=67.52%~76.39%)，铝饱和指数(A/CNK)为0.96~1.05，属偏铝质中-高钾钙碱性系列的花岗闪长岩到二长花岗岩。闪长质包体属偏铝质(A/CNK=0.82)中钾钙碱系列岩石。寄主岩石与闪长质包体具相似的稀土元素配分模式和微量元素蜘蛛图型式，如均富集大离子亲石元素(如Rb、Ba、K、U和Th)、亏损高场强元素(如Nb、Ta、Ti、P和Zr)。寄主岩石中约116Ma的样品具高的($^{87}Sr/^{86}Sr$>)值(0.7145和0.7156)、负的全岩$\varepsilon_{Nd}(t)$(-8.9和-7.8)和锆石$\varepsilon_{Hf}(t)$(-7.1~-3.0)，对应古老的Nd同位素二阶段模式年龄(1.55~1.60Ga)和锆石Hf同位素地壳模式年龄(1.40~1.60Ga)；约110Ma的寄主花岗岩和闪长质包体具偏低的($^{87}Sr/^{86}Sr$>)值(0.7066~0.7095和0.7088)、负的全岩$\varepsilon_{Nd}(t)$(-8.1~-5.2和-7.8)和锆石$\varepsilon_{Hf}(t)$(-6.2~-2.1和-6.8~-0.2)，对应的Nd同位素二阶段模式年龄和锆石Hf同位素地壳模式年龄分别为1.34~1.56Ga和1.20~1.60Ga。结合文献数据提出，尼雄岩体很可能是中上地壳来源的壳源熔体和古老岩石圈地幔来源的幔源熔体不同比例混合而成，并且幔源物质的混入量随时间有增加的趋势(即从约116Ma的50%到约110Ma的65%~75%)。初步认为尼雄岩体可能处于与班公湖-怒江洋壳岩石圈南向俯冲有关的俯冲板片角度变陡并断离(约110Ma)的伸展背景。尼雄岩体在岩浆作用成因、构造背景和地球动力学机制等方面均可与南美智利安第斯富铁成矿带进行很好的对比，因此本文主张，尼雄富铁矿成矿作用与邻近地区的闪长质岩浆活动密切相关，即这些闪长质岩浆活动为尼雄富铁矿床的形成提供了成矿元素。

英文摘要：

The Nixiong Fe-rich deposits mainly grown in the external contact zone of Nixiong pluton in Coqen, Tibet, which is one of the representative Cretaceous plutons widely distributed in Gangdese Orogenic Belt. In order to explore the mineralization mechanism of the Fe-rich deposits, it is vital to understand the petrogenesis of Nixiong pluton nearby. Here we reported petrology, whole-rock major and trace elements, Sr-Nd isotopic data of Nixiong pluton that consists predominantly of granites (~116Ma, 110Ma) with dioritic enclaves (~110Ma), to constrain its petrogenesis and to explore possible link between the Nixiong plutonism and Fe-rich mineralization by comparing with the iron mineralization in Chile Andean, South American. The host granites of Nixiong pluton are enriched in silica (SiO_2=67.52%~76.39%) with aluminum saturation index (A/CNK) of 0.96~1.05, and are metaluminous, medium-high K calc-alkaline, ranging from granodiorite to monzogranite in rock type. Dioritic enclaves are metaluminous (A/CNK=0.82) and medium K calc-alkaline. Both host granites and dioritic enclaves have similar chondrite-normalized REE patterns and primitive mantle normalized trace element spectrum, e.g. enriched in LILEs (Rb, Ba, K, U and Th), depleted in HFSEs (Nb, Ta, Ti, P and Zr). The ~116Ma host granites show high initial $^{87}Sr/^{86}Sr$> (0.7145 and 0.7156), negative whole-rock $\varepsilon_{Nd}(t)$ (-8.9 and -7.8) with old two-stage Nd model ages of 1.55~1.60Ga, and negative zircon $\varepsilon_{Hf}(t)$ (-7.1~-3.0) with Hf crustal model ages of 1.40~1.60Ga; the ~110 Ma host granites and dioritic enclaves are characterized by relatively low initial $^{87}Sr/^{86}Sr$> (0.7066~0.7095 and 0.7088), and enhanced whole-rock $\varepsilon_{Nd}(t)$ (-8.1~-5.2 and -7.8) and zircon $\varepsilon_{Hf}(t)$ (-6.2~-2.1 and -6.8~-0.2), corresponding to two-stage Nd model ages of 1.34~1.56Ga and zircon Hf crustal model ages of 1.20~1.60Ga, respectively. The data reported here, combined with the data in the literature, allow us to propose that the Nixiong pluton is probably the product of varying extents of magma mixing between middle to upper crust-derived silicic melts and ancient lithospheric mantle-derived basic melts, in which the mantle-derived magma trends to increase with t

ime (i.e., from 50% at ~116Ma to 65%~75% at ~110Ma). We suggest that the Nixiong pluton is most likely emplaced within an extensional regime resulting from steepened slab angle followed by slab break-off (~110Ma) that could be attributed to the southward subduction of Bangong-Nujiang Ocean seafloor. The Nixiong pluton can well be compared with Fe-rich deposits in Chile Andean in terms of petrogenesis, tectonic setting, and geodynamic mechanism. Therefor e, we contend that the Nixiong Fe-rich mineralization is closely associated genetically with dioritic magmatism nearby, which probably provide Fe element for the formation of the Nixiong Fe-rich deposits.

关键词：闪长质包体 岩浆混合 富Fe成矿作用 尼雄岩体 西藏措勤

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