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秦岭造山带早古生代蛇绿岩的多阶段演化: 从岛弧到弧间盆地

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摘要:

秦岭商-丹缝合带是分隔北秦岭早古生代造山带和南秦岭晚古生代造山带的地质界线, 其中的丹凤蛇绿岩被洋壳残片。迄今, 前人已经提出多种模式来解释丹凤蛇绿岩成因和构造背景(如: 岛弧、洋岛和成熟的大洋等)。很难解释两个基本事实: (1) 不同类型镁铁质岩(如N-MORB、E-MORB和IAT等)的穿时性分布; (2) 几乎所有的构造环境的叠加。对陕西太白鹦嘴地区一条具有较完整层序的蛇绿岩剖面研究发现, 剖面中存在HTI型(TiO_2 : 0.09%~0.35%)两种类型的镁铁质岩(包括玄武岩和辉长岩), HTI型镁铁质岩具有LREE亏损, 没有Nb、Ta有LREE富集, Nb、Ta负异常的IAT特征。地球化学显示二者的源区均为北秦岭岩石圈地幔楔。本文获得鹦嘴Pb年龄分别为 $523.8 \pm 1.3 Ma$ 和 $474.3 \pm 1.4 Ma$ 。认为秦岭早古生代蛇绿岩应是SSZ环境下多阶段演化的弧盆向北俯冲开始。俯冲板片的脱水作用使熔融温度降低, 形成的流体交代地幔楔, 在北秦岭南缘产生了一个不成阶段, 约524~474Ma。秦岭洋壳的持续俯冲, 在先形成的岛弧上拉张出了弧间盆地, 形成了主要由轻稀土亏损的E-MORB型岩石组合; 第三阶段: 弧前盆地闭合阶段, 474Ma之后。在这个阶段新生的弧间盆地闭合, 俯冲洋壳岩石圈地幔楔相互作用形成了北秦岭李子园的玻安岩。秦岭早古生代蛇绿岩的多阶段成因是典型特提斯构造造

英文摘要:

The origin of the Early Palaeozoic Danfeng ophiolite in Qinling orogen is the key for understanding the evolutionary processes of proto-Tethyan Ocean in China. Several models have been presented to explain the origin of the Early Palaeozoic Danfeng ophiolite, e.g. the model of arc, ocean island and mature ocean basin. However, none of the models fail to explain two facts: (1) the diachronism of different mafic-rock type (N-MORB, E-MORB and IAT) in the ophiolite; (2) the superposition of different tectonic setting. After studying the Yingezui ophiolite of the Early Palaeozoic Danfeng ophiolite in Shaanxi Province, we find that the mafic-rocks (including basalts and gabbros) can be divided into two geochemical groups: HTI (TiO₂: 0.09%~1.07%) and LTI (TiO₂: 0.09%~0.35%). The two groups cover nearly all of the mafic-rock types in the ophiolite. The HTI group with E-MORB affinity is characterized by depletion of LREE without enrichment of Nb and Ta, while the LTI group with IAT affinity is characterized by slight enrichment of LREE and with negative anomalies of Nb and Ta. Earth chemistry shows that the source of both groups is the mantle wedge of the Early Palaeozoic Qinling orogen. The origin of the Early Palaeozoic Qinling ophiolite is a multi-stage model. Stage I: ca. 524Ma, the plate subducts towards the north. With the dehydration of the subduction slab, an immature arc of LTI type mafic-rock was formed in the south rim of the North Qinling terrane. Stage II: the immature arc extended to an arc basin, leading to HTI type mafic-rock (E-MORB). Stage III: after the arc basin closed and merged with the immature arc system, leading to the MORB affinity with IAT. A multi-stage model for the origin of the Early Palaeozoic Qinling ophiolite. Stage I: ca. 524Ma, the plate subducts towards the north. With the dehydration of the subduction slab, an immature arc of LTI type mafic-rock was formed in the south rim of the North Qinling terrane. Stage II: the immature arc extended to an arc basin, leading to HTI type mafic-rock (E-MORB). Stage III: after the arc basin closed and merged with the immature arc system, leading to the MORB affinity with IAT. A multi-stage model for the origin of the Early Palaeozoic Qinling ophiolite.

关键词: [秦岭造山带](#) [早古生代蛇绿岩](#) [弧间盆地](#) [多阶段演化](#)

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