

孟恩, 许文良, 杨德彬, 邱昆峰, 李长华, 祝洪涛. 2011. 满洲里地区灵泉盆地中生代火山岩的锆石U-Pb年代学、地球化学及其地质意义. 岩石学报, 27(4): 1209-1226

满洲里地区灵泉盆地中生代火山岩的锆石U-Pb年代学、地球化学及其地质意义

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基金项目: 本文受国家自然科学基金项目(90814003)、中国核工业地质局科研项目(3R2088404422)、吉林大学研究生"985"工程创基金(20080241)和西北大学大陆动力学国家重点实验室开放基金项目联合资助。

摘要:

本文对满洲里地区灵泉盆地中生代火山岩进行了锆石LA-ICP-MS U-Pb年代学和岩石地球化学研究, 以便对其岩石成因和区域构造演化予制约。研究区内9个代表性火山岩中的锆石均呈自形-半自形晶, 显示出典型的岩浆生长环带或条痕状吸收, 结合其高的Th/U比值(0.25~7.8), 暗示其岩浆成因。测年结果表明, 研究区中生代火山岩可分为3期, 分别以中侏罗世(约166Ma)塔木兰沟组玄武岩类、早白垩世早期(约142Ma)吉祥峰组流纹岩类和早白垩世晚期(约125Ma)上库力组流纹岩类和伊列克得组玄武岩类为代表。中侏罗世(塔木兰沟组)火山岩具有富碱、高钾和高的La/Yb、La/Nb、Hf/Sm、Nb/U和Ce/Pb比值, 以及富集大离子亲石元素(LILEs)、轻稀土元素(LREEs)和亏损Nb等特征, 示其形成应与陆壳加厚之后的岩石圈伸展作用有关; 早白垩世早期(吉祥峰组)火山岩具有高硅、富碱、富K、Rb、Th及低Al、Mg、Ca、Ni、Cr、Ti等特点, 类似于A型流纹岩, 揭示其形成于陆内伸展环境; 早白垩世晚期火山岩具双峰式组合特点, 基性端元具有富碱、高钾、高度富集Es和LREEs, 类似于钾玄质玄武岩, 而酸性端元显示A型流纹岩特点, 揭示该期火山岩应形成于一种与裂谷发育过程相似的强烈引张环境。结合区域中生代火山岩的空间展布特征, 认为中-晚侏罗世和早白垩世早期火山岩的形成应与蒙古-鄂霍茨克缝合带的演化有关, 而早白垩世晚期双式火山岩的形成应与太平洋板块向欧亚大陆的俯冲作用相联系。

英文摘要:

LA-ICP-MS zircon U-Pb dating and geochemical data for the Mesozoic volcanic rocks from the Lingquan basin in Inner Mongolia area were presented in order to constrain their petrogenesis and the regional tectonic evolution. Zircons from nine representative volcanic rocks are euhedral-subhedral in shape and display striped absorption or oscillatory zoning in CL images as well as high Th/U ratios (0.25~7.78), implying their magmatic origin. The dating results indicate that the Mesozoic volcanic rocks in the region can be subdivided into three stages, i.e., the Middle Jurassic (about 166Ma), the early stage of the Early Cretaceous (about 142Ma), and the late stage of the Early Cretaceous (about 125Ma). The Middle Jurassic volcanic rocks, represented by the basaltic rocks from the Tamulangou Formation, are characterized by high alkali content ($K_2O > 3\%$), high La/Yb, La/Nb, Hf/Sm, Nb/U and Ce/Pb ratios, enrichment in large ion lithophile elements (LILEs) and light rare earth elements (LREEs), relative depletion in Nb, indicating that its formation should be related to the lithospheric extension after the crustal thickening. The early stage of the Early Cretaceous volcanic rocks, represented by the rhyolites from the Jixiangfeng Formation, have high SiO_2 and alkali contents, are rich in K, Rb, Th, and relatively poor in Al, Mg, Ca, Ni, Cr and Ti, similar chemically to A-type granites, suggesting that the volcanic rocks should form under an extensional setting. The late stage of the Early Cretaceous volcanic rocks displays a bimodal volcanic rock association, i.e., basaltic rocks from the Yiliekedede Formation and the rhyolites from the Shangkuli Formation. The basaltic rocks are characterized by high alkali (especially K_2O) contents, enrichment in LILEs and LREEs, belonging chemically to the shoshonitic series, whereas the rhyolitic rocks are similar to the A-type rhyolite. The bimodal volcanic rocks should form under an intense extensional setting. Combined with spatial distribution of the Mesozoic volcanic rocks, it is suggested that the formations of the Middle Jurassic and early stage of the Early Cretaceous volcanic rocks could be related to the evolution of the Mongol-Okhotsk orogen, whereas the formation of the latest Early Cretaceous bimodal volcanic rocks should be related to subduction of the Paleo-Pacific plate beneath the Eurasian continent.

关键词：[锆石U-Pb年代学](#) [地球化学](#) [中生代](#) [火山岩](#) [构造背景](#) [灵泉盆地](#) [满洲里](#)

投稿时间： 2009-09-28 最后修改时间： 2010-08-05