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渤海湾黄骅盆地晚中生代—新生代火山岩地球化学: 岩石成因及构造体制转换

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摘要:

本文研究了渤海湾黄骅盆地早白垩世基性-中性-酸性火山岩和第三纪基性火山岩的元素和Sr-Nd同位素地球化学特征。早白垩世火山岩以碱性系列为主, 不同基性程度的岩石具有一致的富集Sr、Ba、K、Rb等大离子亲石元素, 强烈亏损Nb、Ta、Zr等高场强元素, 轻重稀土强烈分异, Sr-Nd同位素组成与EM I相似, Sr同位素初始比高于方城玄武岩和汉诺坝基性麻粒岩。主量和微量元素分析表明, 酸性火山岩主要来自于地壳重熔, 基性火山岩具有板片流体/熔体交代富集的特征, 二者的岩浆混合作用可能是中性火山岩的成因, 它们共同构成了东北亚晚中生代活动大陆边缘岛弧火山岩的一部分。第三纪基性火山岩以碱性系列为主, 弱富集大离子亲石元素和Ti, 不亏损Nb、Ta等高场强元素, Zr呈弱亏损, Sr-Nd同位素组成显示呈亏损型, 亏损程度低于碱锅玄武岩和汉诺坝玄武岩, 但总体与OIB相似, 表明岩浆源区为软流圈地幔, 并且高热上涌的软流圈对上部带有俯冲带印记的岩石圈地幔的萃取可能是导致弱富集的原因。从早白垩世的岛弧环境到第三纪陆内裂谷盆地, 其控制因素可能归咎于东北亚东侧大洋板块的俯冲和相互转换。法拉隆板块于晚中生代向东北亚俯冲, 但晚白垩世时被伊佐奈崎与北新几内亚板块取代, 后者之间的洋脊俯冲引起的“板片窗”效应, 导致了渤海湾地区裂谷盆地的发育和同期软流圈地幔来源的玄武质火山活动。

英文摘要:

The elemental and Sr-Nd isotopic compositions of the Early Cretaceous basic, intermediate and acid lavas and Tertiary basic lavas were analyzed to study their petrogenesis and tectonic implications. The Early Cretaceous volcanic rocks were mainly composed of alkaline series lavas, which had various SiO<sub>2</sub> contents but similarly strongly fractionated REE patterns, enrichment in large ion lithophile elements (LILE), such as Sr, Ba, K and Rb, and lack in high field strength element (HFSE), such as Nb, Ta and Zr. Their Sr-Nd isotopic composition assembled EM I mantle, with higher initial Sr ratios compared with Fangchen basalts and Hannuoba basic granulite xenoliths. Based on the systematics of major, trace and isotopic data, the authors suggested that the acid lavas were products of crustal melting, basic lavas were derived from slab-fluid-metasomatized lithospheric mantle, and their mixing gave birth to the intermediate lavas. They were part of Late Mesozoic island arc volcanic rocks of continental margin in the northeastern Asia. Tertiary basic volcanic rocks were dominated by alkaline lavas, which were barely rich in Ti, not lack in Nb, Ta and slightly lack in Zr. Their Sr-Nd isotopes were similar with OIB but much enriched than Jianguo basalts and Hannuoba basalts. An asthenospheric mantle was indicated for the magma source, and some elemental and isotopic enrichment probably resulted from the extraction of lithospheric mantle by uplifting asthenosphere. The tectonic transition from the island arc in the Early Cretaceous to the Tertiary intra-continental rift could be result of subduction of the oceanic slab and the conversion between different oceanic plates. Farallon Plate subducted beneath the Eurasian continent in its eastern margin, and was then replaced by Izanagi Plate and North New Guinea Plate in the Late Cretaceous. The subduction of the oceanic ridge lying between Izanagi Plate and North New Guinea Plate could have yielded the “slab window” effect, which aroused rifting in the Bohai Bay area and contemporary asthenosphere-derived basaltic volcanicity.

关键词: [渤海湾](#) [黄骅盆地](#) [晚中生代](#) [第三纪](#) [火山岩](#) [俯冲](#) [板片窗](#)

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