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非洲乍得盆地火山岩地球化学特征及成因

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摘要:

钻井揭示了乍得盆地中生代有大量玄武岩喷发, 主要为橄榄拉斑玄武岩, 少数为石英拉斑玄武岩和碱性橄榄玄武岩。主量、微量元素及 Sr-Nd-Pb 同位素地球化学研究表明, 乍得盆地玄武岩岩浆在上升过程中经历了橄榄石、单斜辉石的分离结晶作用, 且未受到陆壳物质的混染; 岩石明显富集轻稀土元素、大离子亲石元素和高场强元素, Nb、Ta、Zr、Hf 具正异常。晚白垩世玄武岩 ( $^{87}\text{Sr}/^{86}\text{Sr}$ )<sub>i</sub> 比值 (0.704167~0.706564) 高于古近纪玄武岩 (0.703545~0.705380), ( $^{143}\text{Nd}/^{144}\text{Nd}$ )<sub>i</sub> 比值 (0.512451~0.512703) 低于古近纪玄武岩 (0.512690~0.512847); 晚白垩世玄武岩  $\epsilon_{\text{Nd}}(t)$  值变化范围较大 (-1.4~3.5), 且明显低于古近纪玄武岩 (2.6~5.6)。两者具有相似的 Pb 同位素比值,  $^{206}\text{Pb}/^{204}\text{Pb}=18.14\sim 18.96$ ,  $^{207}\text{Pb}/^{204}\text{Pb}=15.56\sim 15.62$ ,  $^{208}\text{Pb}/^{204}\text{Pb}=38.33\sim 38.88$ 。乍得盆地玄武岩主要来自于亏损地幔 DM 和富集地幔 EM II 两种端元组分混合产生的, 石榴石橄榄岩的母熔体可能是本区玄武岩产生的源区, 是地幔高度部分熔融的结果 (15% 左右)。乍得盆地玄武岩的地幔组份随时间的演化可能与中生代以来中、西非地区软流圈上涌、岩石圈减薄作用密切相关。

英文摘要:

The boreholes exposed that, during Mesozoic-Cenozoic times, numerous basalts had erupted within Chad basins which are poorly documented. They are mainly olivine tholeiitic basalts, whereas quartz tholeiitic basalts and alkaline basalts are very scarce. Major- and trace elements as well as Sr-Nd-Pb isotopic geochemistry studies exhibit that magmas which the basalts in Chad basins derived from were produced by fractional crystallization of olivine and clinopyroxene and had not do suffered from crustal contamination. These basalts are prominently enriched light rare earth elements (LREE), large-ion lithophile elements (LILE) and high field strength elements (HFSE), and have positive Nb, Ta, Zr, Hf anomalies. The late Cretaceous basalts have higher ( $^{87}\text{Sr}/^{86}\text{Sr}$ )<sub>i</sub> ratios (0.704167~0.706564) than the Paleogene basalts (0.703545~0.705380), whereas have lower ( $^{143}\text{Nd}/^{144}\text{Nd}$ )<sub>i</sub> ratios (0.512451~0.512703) than the latter (0.512690~0.512847). The  $\epsilon_{\text{Nd}}(t)$  values of the late Cretaceous basalts have a wide range (-1.4~3.5) and evidently lower than those of the Paleogene basalts (2.6~5.6), but they have a analogical radiogenic Pb ( $^{206}\text{Pb}/^{204}\text{Pb}=18.14\sim 18.96$ ,  $^{207}\text{Pb}/^{204}\text{Pb}=15.56\sim 15.62$ ,  $^{208}\text{Pb}/^{204}\text{Pb}=38.33\sim 38.88$ ). It is possible that the basalts from Chad basins mainly formed by mixing of depleted mantle (DM) and enriched mantle (EMII) sources and the parental melts were probably generated by high degree partial melting of garnet peridotite (15%). The mantle components with temporal change observed in basalts from Chad basins were probably correlated with the asthenospheric mantle upwelling and lithospheric thinning in Central and Western Africa since Mesozoic.

关键词: [乍得盆地](#) [火山岩](#) [地球化学](#) [岩石成因](#) [非洲](#)

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