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准噶尔盆地克拉美丽气田石炭系玄武岩的地球化学特征及构造意义

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摘要:

克拉美丽气田位于准噶尔盆地腹部陆梁隆起南侧的滴南凸起上,石炭系火山岩为该气田的主要储层,石炭系的火山岩研究对该地区的储层分布预测与气田开发方案制定,以及盆地基底性质与盆地构造沉积演化研究都具有重要意义。本文对克拉美丽气田滴西17井的石炭系火山岩的岩石学、地球化学与构造环境进行了研究。滴西17井石炭系的玄武岩表现为:岩石的斑晶中出现橄榄石、单斜辉石;基质呈间粒结构;长石多为中基性斜长石。岩石具有较高的 Na_2O 含量,介于6.27%~7.35%之间, $\text{K}_2\text{O}/\text{Na}_2\text{O}$ 比值(0.01~0.03)却很低,较高的 TiO_2 (3.00%~3.63%) and P_2O_5 (0.83%~1.03%)含量,低程度的轻稀土富集($(\text{La}/\text{Yb})_N=3.36\sim 3.44$),高的Nb含量($14.86\times 10^{-6}\sim 17.47\times 10^{-6}$),原始地幔标准化的 La/Nb 比值均小于2, Th/Nb 比值小于1,不相容元素整体偏高。该玄武岩略显铕($\delta\text{Eu}=0.90\sim 0.93$)的负异常,未见铈($\delta\text{Ce}=0.99\sim 1.01$)异常;微量元素MORB标准化表现为大离子亲石元素LILE相对亏损,高场强元素相对富集,并具有Nb、Ta亏损的地球化学特征,构造判别图解显示该套玄武岩形成于板内环境。以上特征表明,该玄武岩为受到弧组分混染的后碰撞伸展环境下的产物,来自于岩石圈断陷作用下的上地幔熔体。准噶尔盆地陆梁隆起在晚石炭世处于后碰撞伸展环境;该区玄武岩带有岛弧火山岩印记,为准噶尔盆地的基底可能为岛弧拼接基底提供了证据,从而认为早石炭世准噶尔盆地可能存在多岛构造格局。

英文摘要:

The Karamaili gas field is located at Di'nan uplift of the south of Luliang uplift in Junggar Basin, Carboniferous volcanic rocks are the main reservoir of the gas field. The research about carboniferous volcanic rocks is of great significance to the region's reservoir distribution prediction, gas field development planning, and the study of the nature of basement and its tectonic and sedimentary evolution. In this paper, the study of well-Dixi17 focuses on petrology, geochemistry and tectonic environment. Carboniferous basalt of well-Dixi17 shows: the basalt is characterized by occurrence of olivine and clinopyroxene in phenocryst; matrix shows intergranular texture; feldspar is the almost basic plagioclase. These samples have relatively high Na_2O content which ranges from 6.27% to 7.35%, but low $\text{K}_2\text{O}/\text{Na}_2\text{O}$ ratios (0.01~0.03), relatively high TiO_2 (3.00%~3.63%) and P_2O_5 (0.83%~1.03%) content, low-level enrichment in LREE ($(\text{La}/\text{Yb})_N=3.36\sim 3.44$), high Nb content ($14.86\times 10^{-6}\sim 17.47\times 10^{-6}$). Primitive mantle standardized La/Nb ratio is less than 2.0. Th/Nb ratio is less than 1.0. All the incompatible elements are relatively high. These basalt rocks suggest weak Eu anomalies ($\delta\text{Eu}=0.90\sim 0.93$), with significant Ce anomalies. MORB standardized diagram of trace element exhibits LILE depletion, while HFSE enrichment relatively and weak negative Nb-Ta anomalies. Tectonic discrimination diagrams show that the set of basalt formed in an intraplate setting. These characteristics suggest that these basalts came from rift lithosphere under the upper mantle melt and that they are the production of extensional setting post-collisional period which is contaminated by arc component. Luliang uplift of Junggar Basin in the area have island-arc volcanic rocks mark, which provides evidence for the view of arc splicing basement of Junggar Basin, so it is inferred that there exists a potential pattern of multi-island tectonic framework in the Junggar Basin during Early Carboniferous period.

关键词: 石炭系 后碰撞 弧组分混染 基底性质 盆地构造演化 克拉美丽气田 准噶尔盆地

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