

囊谦古近纪盆地砂岩地球化学特征及其对物源和沉积环境的指示作用

Geochemical characteristics of Paleogene sandstones in Nangqen basin and their implications for provenance and sedimentary environments

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中文关键词: [囊谦盆地](#) [微量元素](#) [稀土元素](#) [物源](#) [沉积环境](#)

英文关键词: [Nangqen basin](#) [trace element](#) [rare earth element](#) [provenance](#) [deposition environment](#)

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中文摘要:

砂岩地球化学特征对物质来源、古气候和沉积环境具有十分重要的示踪和指示作用。通过分析砂岩的微量元素和稀土元素含量的变化,研究了囊谦盆地沉积环境、古气候及物源特征。结果表明:囊谦古近纪盆地的古环境为气候干旱炎热、氧化环境;微量元素中的深源元素低于地壳粘土岩中的平均值,说明物源为陆源物质,而陆源元素则与地壳粘土岩中的平均值相当,反映沉积速度快;砂岩的REE北美页岩和球粒陨石标准化配分模式表现出轻稀土元素富集、重稀土元素亏损但变化平缓,反映典型的沉积成因特征;Th/Sc、Th/U、La/Th元素比值和La/Sc-Co/Th、Th-Hf-Co、La/Yb-ΣREE以及砂岩函数判别图解显示囊谦古近纪盆地碎屑岩物源具有多样性,主要来自于上地壳长英质源区,源岩可能为沉积岩、酸性火山岩和拉斑玄武岩的混合。

英文摘要:

Geochemical characteristics of detrital sandstones provide an extremely important trace and indication for provenance, paleoclimate, depositional environment and properties of source rock. On the basis of field geological investigation, the authors studied the characteristics of trace and rare elements of the sandstones and probed into the features of depositional environment, paleoclimate and provenance by analyzing the change of the trace and rare element components of the sandstones. Sampling was conducted along the section of well-developed outcrops, and the weathered and altered samples were rejected under a microscope. The trace element content of sandstone samples collected from Gonjo Formation was determined by inductive coupling plasma mass spectrometry (ICP-MS). The sedimentary environment and properties of the source region of the sandstones in the Gonjo Formation were also investigated by means of ratios of Sr/Ba, Ce/Ce*, Th/Sc, Th/U and La/Th as well as graphic interpretation of depositional structure background and cross-analysis of such multiple parameters as La/Sc-Co/Th, Th-Hf-Co, Th/Sc-Sc and La/Yb-ΣREE. The results show that cerium was subjected to deficiency, and that the physicochemical properties of water bodies belonged to the oxide environment, because the ratio of Ce/Ce* is between 0.80 and 0.93, and the index of Ce_{anom} is between -0.34 and -0.5. The values of deep source elements in trace elements are lower than the average value of earth crust claystone, which indicates that the sources of sediments were mainly derived from terrestrial material. Terrestrial elements and the average of earth crust clayrock are evenly matched, which reflect high deposition rate. The ratios of trace elements show obviously that the sedimentary environments were of fresh water quality, oxidizing environments and arid torrid climate during the period of the deposition of Gonjo Formation in the Paleogene basin, with the further deposition of the sediments consisting of salt, gypsum and marl. The LREE content is obviously enriched in comparison with the HREE content, with negative Eu anomalies shown in the chondrite aerolite standard pattern of sandstone of Gonjo Formation. However, the LREE content is slightly enriched, with indistinct Eu anomalies shown in the North American shale standard pattern of sandstone, which suggests that the depositional environment was an oxidizing environment with typical sedimentary characteristics. Based on an analysis of the ratios of trace elements such as Th/Sc, Th/U and La/Th as well as an analysis of such diagrams as La/Yb-ΣREE, the authors have arrived at the conclusion that the diverse sources mainly came from felsic source region of the upper crust, and that their original rocks were sedimentary rocks, acid volcanic rock and tholeiite.

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