Geochemistry and petrogenesis of dolostone from the Paleogene Shahejie Formation in Qikou depression, Bohaiwan basin, China

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Petrogenesis of dolostones from the Paleogene Shahejie Formation, Qikou depression, Bohaiwan basin, China has been a controversial. This paper reports carbon-oxygen isotopic and, trace element compositions of the dolostones from the Paleogene Shahejie Formation, Qikou depression, Bohaiwan basin, with the aim of revealing petrogenesis of dolostone.

Two major types of dolostones can be recognized as dolomicrite and grainy dolostone in the study area. The $\delta^{13}C$ and $\delta^{18}O$ values from 24 selected samples in the 2th section of the Paleogene Shahejie Formation range from -1.2‰ to 2.4‰ (V-PDB, averaging 0.7‰) and -6.8‰ to -3.9‰ (V-PDB, averaging -5.5‰), respectively. There is a positive relation between their $\delta^{13}C$ and $\delta^{18}O$ values, indicating a closed environment. Based on their minor correlation coefficient (<0.7), it is suggested that an external fluid might have been involved in their formation. Their total rare earth element abundance vary from 45.41 to 151.89 ppm (averaging 83.56 ppm), being higher than those of the marine carbonate. Additionally, their Y/Ho ratios are between 27.7 and 30.7 (averaging 29.7), similar to the average value of the upper crust (27.5). Their Sr/Ca ratios range from 0.0125 to 0.034, yielding an average value of 0.0180, which is located within those of the fresh water. The above results indicate that dolomitization could take place in the continental environment.

Nevertheless, their $^{87}Sr/^{86}Sr$ ratios (0.7092 to 0.7099, averaging 0.7095) are lower than that of fresh water (0.7119) [1] and higher than the average value (0.7080) of the sea-water in the Paleogene [2], indicating that the marine transgression might be the most important factor during formation of the Paleogene dolostones. Based on the empirical formula of Keith and Weber [3], we calculate that Z values (121.7~129.7) of the dolostones are more than 120, similar to ones of the marine carbonates. Combined with their buried depths (from 454m to 903m), we propose that that these Paleogene dolostones could form in a shallow buried diagenetic environment with the high salinity, which is also supported by their positive Gd anomaly showing a seawater source during the dolomitization.

In summary, we conclude that the Paleogene dolostone in the study area formed under a shallow burial condition, which had been influenced by the Rupelian transgression in the Paleogene.

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Study on distribution regularities of the soil radionuclide contents in China

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Radionuclide content in soil is an important component to study the environment natural radioactivity level. It provides a reference for timely detection of radioactive contamination of the environment and has significance for an accurate assessment of environmental radioactive contamination. Therefor, it's necessary to research the contents of ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K by combining with the distribution of uranium resources in China and the geological background of the provinces.

Through this survey, the area-weighted content average values of radionuclides ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K in 28 provinces and cities in China were 39.5, 36.5, 49.1 and 580.0 Bq/kg respectively. The results approximated to the national average. The content of ^{238}U was slightly higher, and the contents of ^{226}Ra, ^{232}Th and ^{40}K were slightly lower. At the same time, the results were higher than the world average values of ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K, but they belonged to the normal background level of the world[1].

By analyzing the changes of the soil radionuclide contents in 28 provinces along with the provinces, it could be seen that the contents of soil ^{238}U, ^{226}Ra and ^{232}Th were basically the same trend, namely one nuclide content in a province was high, the other two nuclide contents were also high, but the content of ^{40}K did not have this trend, which was influenced by human factors, such as burning straw and sowing the potash to the soil.

Through the survey, the contents of soil ^{238}U, ^{226}Ra and ^{232}Th in Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Tibet, Yunnan and Zhejiang provinces were the top eight. In the eight provinces, the soil mother rocks of Fujian, Guangdong, Jiangxi, and Hunan mainly were granite, that of Tibet mainly were sediment and granite, and that of Zhejiang mainly were the quaternary and clay. Thus when soil mother rock was the granite, the contents of natural radionuclides in the soil were relatively high. The extensive granite was one of the reasons for higher levels of radionuclide contents in the soil in China.

By the end of 2008, more than 340 uranium deposits had been proved up. The resources were occupied 90 percents by 10 provinces which were Jiangxi, Inner Mongolia, Guangdong, Xinjiang, Hunan, Guangxi, Hebei, Liaoning, Yunnan and Zhejiang. In the top 8 provinces whose soil radionuclide contents were high, the uranium resources of six provinces were in the top ten. It was obvious that the uranium resources were relative with the soil radionuclide contents.

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