

3.84 Ga crustal material in Dunhuang Block, Gansu Province, China

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Crustal materials formed in the early period of solid earth ($\geq 3.8\text{Ga}$) are few reserved in the world. We get magma crystallization age 3841 ± 16 Ma from metamorphic amphibolite of Dunhuang block rock recently (Fig. 1, Table.1), which is the oldest crustal material had been detected in Dunhuang block, and early earth material found in metamorphic basic volcanics is also rare in the world yet. This metamorphic basic volcanics belong to sub-alkaline volcanics and tholeiite series with $\text{SiO}_2 = 47.94 \times 10^{-2} \sim 49.32 \times 10^{-2}$. We also get metamorphic zircon ages of $\sim 3.5\text{Ga}$ and 3.3Ga , consistent with previous Sm-Nd age 3487Ma . It indicates that Archean basement exist in Dunhuang block. This new result has important significance for exploring and studying the age, properties and growth characteristic, and developing comparison study between Dunhuang block and Huabei craton.



Figure 1: CL images and ages of zircons for amphibolite of Dunhuang rock group

Samp.	$^{207}\text{Pb}/^{206}\text{Pb}$	1σ	$^{207}\text{Pb}/^{235}\text{U}$	1σ	$^{206}\text{Pb}/^{238}\text{U}$	1σ
23	3841	16	3842	6	3845	17
24	3820	15	3608	65	3240	14
16	3496	16	3311	6	3015	13
34	3332	17	3332	7	3331	16

Table 1: older zircon U-Pb data for amphibolite from Dunhuang rock group(Ma)

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Implications of fault spilling gases in searching active ruptures

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The seeped gases as called as fault spilling gases may contain abundant information about the geological processes in the deep Earth, and also be significant in searching and studying on the spatial distribution and activity of faults. In this paper, a systematic study was performed on the Yishu tectonic zone, the Haiyuan tectonic zone for an Ms8.5 earthquake in 1920, the Tancheng tectonic zone for an Ms8.5 earthquake in 1668, the Xanshuihe tectonic zone, and several active faults in the Shandong flatlands and some major results were summarized as the followings.

1, the concentration of Rn and Hg and their variation degree of fault spilled gas could be used as sensitive index to evaluate the activity of faults connection. Higher concentration of Rn and lower Hg may indicated stronger stress accumulation and poorer connection of faults, lower concentration of Rn and higher Hg may indicated lower stress accumulation and better connection of faults, and lower concentrations of both Rn and Hg may indicate poorer stress accumulation and poorer connection of faults.

2, the measurement of fault spilled gas has been implied well in searching active faults in the flatlands area. The Rn measurement of fault spilled gas combined with engineering drilling profiles to the Yidu fault zone, the Shuangshan-Lijiazhuang fault zone, and the Heze fault zone for the Ms7.0 earthquake in 1937 was successful to identify all the locations and displacement of faults, and their activity times.

3, the measurement of fault spilled gas can be also used well in the geometric and kinetic studies of faults. The structural pivot area, the pull-apart area and the compression area of strike-slip faults could be located according to the distribution pattern of geochemical surroundings from the measurement of fault spilled gas, which may supply a fast and simple method to study on the geometric and kinetic properties of faults and used successfully to the Haiyuan seismic fault zone and the Xianshuihe fault zone.