

MA Yanping, ZHAO Jingzhou, 2015. Geochemistry and Petrography of Clastic Deposits from the Late Paleozoic Shihezi Formation in the East Central of Ordos Basin, China: Implications for Provenance and Tectonic Setting. *Acta Geologica Sinica* (English Edition), 89 (supp.): 266-267.

Geochemistry and Petrography of Clastic Deposits from the Late Paleozoic Shihezi Formation in Eastern Ordos Basin, China: Implications for Provenance and Tectonic Setting

MA Yanping*, ZHAO Jinzhou

1 School of Earth Sciences and Engineering, Xi'an Shiyou University, Xi'an, Shaanxi, 710065

1 Introduction

Provenance studies are central to the reconstruction of paleo-drainage systems, which in turn may lead to an improved understanding of potential reservoir distribution (Preston J et al., 2002). Ordos basin developed tight gas sandstone reservoir in the Upper Paleozoic. The sandstone reservoirs show different terrigenous clastic components, which in turn may influence the diagenesis and reservoir physical property. The mineralogy and petrology of sandstones is ultimately controlled by the make-up of the source area. Clastic compositions must be taken into account when attempting to understanding of potential reservoir distribution. Reconstruct the provenance and paleodrainage patterns of ancient continental sedimentary successions plays a positive role in further prospecting and research the tight gas sandstone. Several trace elements, such as La, Ce, Nd, Gd, Yb, Y, Th, Zr, Hf, Nb and Sc are most suited for discriminations of provenance and tectonic setting because of their relatively low mobility during sedimentary processes and their short residence times in seawater (Holland 1978; Taylor and McLennan 1985). These trace elements with major elements are used to discriminate tectonic environments and source-rock compositions (Bhatia, et al., 1986; 1985; Gu, et al., 2002).

Petrographic, major, trace, and rare earth element compositions of sandstones from the Late Paleozoic Shihezi Formation in the East of Ordos basin, China, have been investigated to determine their provenance and tectonic setting.

2 Petrography Constraint to Provenance

Petrologic studies demonstrate that all sandstone

samples from Shihezi Formation are highly enriched in quartz (Q) but poor in lithic fragments and feldspar (F). The sandstone samples consist mainly of lithic quartz sandstone and litharenite with abundant metamorphic and volcanic fragments. On Q-F-L plots sandstones fall into the field of recycled-orogenic source.

3 Geochemistry of Deposits Constraint to Provenance

Chondrite-normalized Rare earth elements (REEs) patterns of mudstone samples from Shihezi Formation with LREE enrichment, flat HREE, and negative Eu anomaly are attributed to felsic source-rock characteristics for Shihezi Formation sandstones. REE patterns of mudstone samples from study area are very similar to those of Archeozoic and Proterozoic metamorphic rocks, such as granitic gneiss, monzonitic gneiss, diorite gneiss, biotite plagioclase gneiss, biotitequartz schist, granulite, mixed granite, etc, which from Daqing Mountain, Wula Mountain, and Yin Mountain.

Major elements geochemistry of mudstones demonstrates that the most were derived from an active continental margin and passive continental margin, but some from an island arc of passive continental margin. Trace elements geochemistry favors a continental-arc provenance mostly from felsic rocks.

4 Implications for Tectonic Setting

The major and trace elements geochemistry of mudstones indicate that the source area have experienced a complex tectonic setting, which related to combining tectonic settings with active continental margin, passive continental margin, and continental arc, which correspond to the tectonic setting of northern source area. At the

* Corresponding author. E-mail: bye9@sohu.com

northern edge of the basin, the north margin of Ordos plate collision with Yin Mountain during 1800~2000Ma (Wu, et al., 2006; Lin, et al., 2009; Chen, et al., 2012), which result in the collision belt towards continent, the tectonic setting have both active continental margin, passive continental margin and continental arc.

This deduction demonstrates that the uplift of the northern source area during late Paleozoic was the major source of Shihezi Formation.

5 Conclusion

This article identified that in the study area at least three coordinate of ancient water system at that time were reconstructed, which provide source to the basin from the erosion source area in the north. The tectonic setting have both active continental margin, passive continental margin and continental arc.

The paper rebuilt the sedimentary palaeocurrent systems distribution pattern of He-8 member in the eastern Ordos basin, which can provide basic data in distribution of sedimentary sand body and reservoir prediction, and it is important to prospect the oil and gas exploration.

Acknowledgment

This study was supported by the National Natural Science Foundation of China(No. 40902042; 41330315) .

References

- Preston, J., et al. 2002. The provenance of Triassic continental sandstones from the beryl field, northern North Sea: mineralogical, geochemical, and sedimentological constraint. *Journal of sedimentary research*, 72(1):18-29.
- Holland, H.D., 1978. *The Chemistry of the Atmosphere and Oceans*: New York, Wiley, 351.
- Taylor, S.R., and McLennan, S.M., 1985, *The Continental Crust: Its Composition and Evolution*: London, Blackwell, 312.
- Bhatia, M.R., 1985. Rare earth element geochemistry of Australian Paleozoic graywackes and mudrocks: province and tectonic control. *Sedimentary Geology*, 45: 97-113.
- Bhatia, M.R., Crook, K. A. W. 1986. Trace element characteristics of graywackes and tectonic setting discrimination of sedimentary basin. *Contributions to Mineralogy and Petrology*, 92: 181-193.
- Gu, X.X., Liu, J.M., Zheng, M.H., et al. 2002. Provenance and tectonic setting of the Proterozoic turbidites in Hunan, South China: geochemical evidence. *Journal of Sedimentary Research*, 72(3) :393-407.
- Wu, C.H., Sun, M., Li, H.M., et al. 2006. LA-ICP-MS U-Pb zircon ages of the khondalites from the Wulashan and Jining high-grade terrain in northern margin of the North China Craton :constraints on sedimentary age of the khondalite. *Acta Petrologica Sinica*, 22(11): 2639-2654.
- Lin, H. B., Hou, M. C., Chen, H. D., Dong, G. Y. 2009. Provenance analysis and its geological significance of Shan1 session and He8 session in northern Sulig gas field, Ordos basin, China. *Geological Bulletin of China*, 28(4): 483-492.
- Chen, Q.H., Li, W.H., Hu, X.L., et al. 2012. Tectonic setting and Provenance analysis of Late Paleozoic sedimentary rocks in the Ordos Basin. *Acta Geologica Sinica*, 86 (7):1150-1162.