

LIU Yang, WANG Ling, WANG Xichen, DONG Guochen, WU Yunjun, ZHAO Ye, WANG Zhuo, WANG Jun, JIANG Man and MIN Yangzi, 2014. Isotopic Characteristics and Significances of the Luobusha Ophiolite. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 300-301.

Isotopic Characteristics and Significances of the Luobusha Ophiolite

LIU Yang¹, WANG Ling², WANG Xichen³, DONG Guochen², WU Yunjun³, ZHAO Ye³,
WANG Zhuo³, WANG Jun³, JIANG Man³ and MIN Yangzi³

1 China Railway Resources Exploration Co. Ltd, Beijing 100083, China

2 China University of Geosciences, Beijing 10083, China

3 Central Geological Exploration Fund of Ministry of Land and Resources of the People's Republic of China, Beijing 100083, China

1 Introduction

Yarlung Zangbo suture is one of intra-continental suture zones in Gondwana plate and represent material residual for neo-Tethyan ocean close. The ophiolite in the suture zone is distributing along the Yarlung Zangbu River, forming the largest ophiolite belt in China, which is composed of prototite, basic-ultrabasic cumulate complexes, dolerite, silicic rock and basic lava etc. in which the peridotite as the main component of the ophiolite had undergone strong deformation with dolerite intruded along faults. There is podiform Chromite in the peridotite with diabase developed locally and plagioclase obducted up on the mid- upper part of accumulate.

Petrology, geochemistry and isotopic data of peridotite in the ophiolite were studied to discern the relationship among the ophiolite and chromite metallogenesis and the tectonic settings.

2 Petrology, Geology and Geochemistry of the Ophiolite

The peridotite of Yarlung Zangbu ophiolite were allotriomorphic and porphyrotopic texture and the phenocrysts were fractured and consisted mainly of dark minerals such as olivine and clinopyroxene with varying size from 0.05mm to 6mm, up to 10mm. The olivine in peridotite has clear bacon line and kink band with undulate extinction (Fig. 1a). there are inclusions of euhedral Cr spinel in the olivine crystal. All the olivine crystals elongated as tabular and some individual grains enlarged by recrystallization with residual subsolidus under upper mantle faces. Retiform serpentines developed in the peridotite as cataclastic texture. Orthopyroxene had

exsolution schlieren (Fig.1b).

There is pisolitic chromite in peridotite of the Yarlung Zangbu ophiolite. The ore minerals had no direct relation to dunite in content and did not occurred only in dunite, indicating the dunite was not the direct source of mineral (Wang et al., 1978).

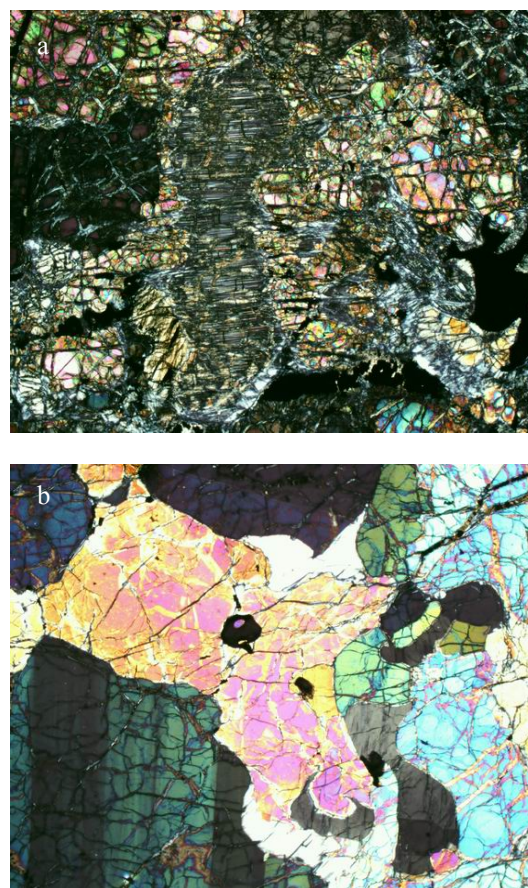


Fig.1. Peridotite in the Yarlung Zangbu ophiolite.

* Corresponding author. E-mail: bjwangxch@126.com

Table 1 Rb-Sr isotopic composition of peridotite in Luobusha ophiolite

Lithology	Sample No.	$^{87}\text{Rb}/^{86}\text{Sr}$	$^{87}\text{Sr}/^{86}\text{Sr}$	Isr	$\varepsilon_{\text{Sr}}(0)$	$\varepsilon_{\text{Sr}}(t)$	$f^{\text{Rb/Sr}}$	ΔSr
Harzburgite	LB108	0.593	0.711235	0.709861	95.6	78.8	6.17	112.35
	LB109	1.595	0.714995	0.711299	149.0	99.2	18.29	149.95
	LB115	1.999	0.714874	0.710242	147.3	84.3	23.17	148.74
	LB122	1.698	0.712313	0.708379	110.9	57.8	19.53	123.13
Cpx peridotite	LB74	2.260	0.714191	0.708955	137.6	66.0	26.32	141.91
Lherzolite	LB101	0.342	0.711829	0.711038	104.0	95.5	3.13	118.29
	LB102	0.335	0.715401	0.714625	154.7	146.5	3.05	154.01
Dunite	LB81	1.150	0.712467	0.709801	113.1	78.0	12.91	124.67
	LB82	1.318	0.708544	0.705489	57.4	16.8	14.94	85.44
	LB86	1.232	0.711211	0.70836	95.3	57.5	13.90	112.11
	LB88	0.537	0.709783	0.708538	75.0	60.1	5.49	97.83
	LB89	1.119	0.708194	0.70560	52.4	18.4	12.53	81.94
	LB96	0.170	0.713365	0.712970	125.8	123.0	1.06	133.65
	LB99	0.583	0.711932	0.710581	105.5	89.1	6.05	119.32
Chromite	LB171	1.389	0.710962	0.707743	91.7	48.8	15.80	109.62

Ophiolite is the residual of ocean slab which usually undergone the mantle fluid metasomatism and sea water alteration. Strontium is active element and easily affected by geologic process. The Sr content is 0.324~8.911 $\mu\text{g/g}$, averagely 2.546 $\mu\text{g/g}$ in Luobusha ophiolite, 0.48~8.911 $\mu\text{g/g}$, averagely 3.351 $\mu\text{g/g}$ in dunite, and Rb/Sr ratio is 0.032~0.780, averagely 0.354. By comparison, it can be easily concluding that the dunite of Luobusha ophiolite is equivalent to the peridotite of classic ophiolite in the would in Sr content and Rb/Sr ratio (Coleman, 1977).

$^{87}\text{Sr}/^{86}\text{Sr}$ ration in Luobusha ophiolite varied between 0.708194~0.715401, averagely 0.712029 with initial Sr isotopic composition of Sr =0.705489~0.714625 and $\varepsilon_{\text{Sr}}(t) = 16.76\sim 146.47$, indicating that the Isr in the ophiolite is slightly higher than the one in Mantle peridotite of ophiolite in the would (Zhong et al., 2006) (table 1).

Isotopic geochemical study indicated that the Yarlung Zangbu ophiolite is the same as other ophiolites in Tethyan suture and has classical Indian Oceanic type Sr, Nd and Pb features.

3 Conclusion

Sr values from Luobusha ophiolite are high and $^{87}\text{Sr}/^{86}\text{Sr}$ is higher than that of overlying strata, indicating a rich mantle source was existed. The magma that chromite deposit formed has different source from peridotite of deep mantle and undergone crust fluid metasomatism and sea water alteration.

The radiogenic lead (anomaly lead) is rich in the total lead. Combined with the strontium characteristics, it is demonstrated that the mantle source for the ophiolite presented an obvious dupal isotopic anomaly.

The peridotite (spinel lherzolite) association is comprised following mineral assemblage of olivine, pyroxene and some spinel, which is formed in upper

mantle at 60-90km under 20-30kb.

Acknowledgement

This study was jointly supported by “Program for Changjiang Scholars and Innovative Research Team in University(IRT1083) and Programme of the China Geological Survey (1212011220920).” We thank the help for Mr. Hongqi Chen, Chelf geologist of No 5 geological brigade of Xizang Bureau of Geology and mineral exploration.

References

- Miyashiro A. 1975. Classification, characteristics and origin of ophiolites. *J. Geol.*, 83: 249-281.
- Coleman R. G. 1977. Ophiolite-ancient oceanic lithosphere? Springer-Verlag Berlin Heidelberg, New York.
- Xia Bin, Guo lingzhi, Shi Yangshen.1998. The ophiolites and tectonstratigraphic terranes in Southwest Xizang(Tibet). Chung Tai Educational Press, Guangzhou.
- Wang Xibin, Bao Peisheng, Xiao Xuchang. 1987. The ophiolites in The Yarlung Zangbu. Surveying and Mapping Press. Beijing.
- Zhong Lifeng, Xia Bin, Cui Xuejun, Zhou Guoqing, Chen Genwen, Wei Dongliang. 2006. Geochemical characteristics and origin of the Luobusha ophiolite crust lavas in Xizang, China, *Geotectonica et Metallogenia*, 32 (2): 231-240
- Briqueu L, Lancelor J R. Rb-Sr systematics and crustal contamination models for calc-alkaline igneous rocks. *Earth Planet Sci Lett*, 1979, 43: 381-396.
- Dupre B and Allegre C J. 1983. Pb-Sr isotope variation in Indian Ocean basalts and mixing phenomena. *Nature*, 303: 142-146.
- Wei Qirong, Shen Shangyue, Mo Xuanxue, Lu Fengxiang. 2003. Recognition and significance of Dupal isotope anomaly in the middle part of Sanjing area.
- Metcalfe I. 1996. Pre-Cretaceous evolution of SE Asian terranes. In: Hall R and Blundell D(eds.), *Tectonic evolution of Southeast Asia*. P.97-122. *Geology-Geochemistry*, 31(1): 36-42.