SHI R.D., GRIFFIN W.L., O'REILLY S.Y., HUANG Q.S., LIU D.L., GONG X.H., CHENG S.S., WU K. and YI G.D., 2015. Ophiolitic Chromitites Originated from Ancient SCLM. *Acta Geologica Sinica* (English Edition), 89(supp. 2): 84.

Ophiolitic Chromitites Originated from Ancient SCLM

SHI R. D.[1, 2*], GRIFFIN W. L.[2], O'REILLY S. Y.[2], HUANG Q. S.[1], LIU D. L.[1], GONG X. H.[1], CHENG S. S.[1], WU K.[1] and YI G. D.[1]

1 *Institute of Tibetan Plateau Research, CAS, Beijing 100101, China*
2 *GEMOC/CCFS, Earth and Planetary Sciences, Macquarie University, NSW 2109, Australia*
3 *Department of Earth Sciences, The University of Hong Kong, Pokfulam Road, Hong Kong, China*

Ophiolitic chromitites are traditionally considered as the products of melt-mantle interaction in the supra-subduction zone after partial melting of mantle peridotites during upwelling of asthenosphere at oceanic spreading centers. The occurrence of natural diamonds *in situ* in chromitites and peridotites in southern Tibet（Yang et al., 2013; Griffin et al., 2013）suggest that at least some "ophiolitic" chromitites have a more complex history. Meanwhile, more and more Paleozoic to Archean materials have been documented in ophiolitic peridotites and chromitites, based largely on Re-Os dating of whole-rock samples and enclosed sulfides and alloys(Shi, R. D. et al., 2007; 2012a; 2012b), These data suggest that the genesis of the ophiolitic podiform chromitites is not completely understood, and encourages a new approach.

Here we emphasize the role of source in the formation of chromitites based on the contrast in Os isotopic compositions of chromitites and chromitite-bearing peridotites from the Luobusa massif and chromitite-free peridotites from the Zedang massif 10 km west of Luobusa along the Yarlung-Zangbo Neo-Tethys suture zone. The whole-rock $^{187}Os/^{188}Os$ ratios of the Zedang chromitite-free lherzolites vary narrowly from 0.1256 ± 0.0008 to 0.1261± 0.0008(Shi, R. D. et al., 2012c) consistent with the Os-isotopic compositions expected in the convecting upper mantle of the Tethys Ocean(Huang, Q. S. et al., 2013). In contrast, the whole-rock $^{187}Os/^{188}Os$ values of these chromitite-bearing peridotites and chromitites from Luobusa vary from 0.1038±0.0006 to 0.1263±0.0008, yielding Re depleted model (T_{RD}) ages back to 3.4 Ga with most ages between 0.8 Ga and 2.6 Ga; this suggests that the host rocks to the Luobusa peridotites probably represent relics of an ancient sub-continental lithospheric mantle (SCLM) (Shi, R. D. et al., 2012c) . Combined with the Re-Os data on ophiolitic podiform chromitites worldwide(Walker, R. J. et al., 2002), and recognizing that whole-rock model ages must represent minimum estimates, it appears ancient (largely Archean?) SCLM plays a key role in the genesis of ophiolitic chromitites.

This idea may be supported by the special phenomenon that deserves consideration, that is the Chromium content in the present mantle is lower than the estimated value by the carbonaceous chondrites, while other major and moderately volatile elements (Al, Ca, Mg, Si, Mn, Na, Zn) are in well-balance value(Palme H et al., 2003), where's Chromium gone? Griffin et al (2003) found the Cr_2O_3 abundance of garnets from kimberlites and lamproites in Archean subcontinental lithospheric mantle (SCLM) up to 15wt%, is higher than that in the Proterozoic SCLM (up to 10 wt% in Yangtze Craton), and higher than in Phanerozoic SCLM (up to 5wt% in Taihang-Luliang Craton) (Griffin W. L. et al. 2003), indicating that the Cr likely partitioning into the bottom of SCLM instead of the core during the ancient crust-mantle differentiation, meaning the Chromium is first stored in Cr-rich garnets (which may indicating) and then changed to Cr-spinel during the rift of ancient continent by the listric fault, finally, the chromitites formed in the supra-subduction zone.

Acknowledgements

This work was supported by the National Basic Research Program of China (2011CB403101) and the National Natural Science Foundation of China (41372063 and 41172059).

References

Yang J. S., 2013. Nature Geoscience (subm.).
Griffin et al., 2013. Goldschmidt Abstract.
Shi R. D. et al., 2007. EPSL, 261: 33-48.
Shi R. D. et al., 2012a. Precam. Res. 216-219: 87-94.
Shi R. D. et al., 2012b. Gond. Res. 21: 194-206.
Shi R. D. et al., 2012c. Geol. Rev. 58: 643-652.
Huang Q. S. et al., 2013. CSB, 58: 92-98.
Walker R. J. et al., 2002. GCA, 66: 329-345.
Palme H. & O'Neill, HSC. 2003. TOG, 2:1-38.
Griffin W. L. et al. (2003), Precam. Res., 127: 19-41.

* Corresponding author. E-mail: shirendeng@itpcas.ac.cn