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Petrological, Geochemical and the Origin of the Cuobuzha Peridotite in the Western Yarlung Zangbo Suture Zone

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Ophiolites are fragments of ancient oceanic lithosphere emplaced onto continental margins, accretionary prisms, or island arcs during plate collisions (Dilek and Furnes, 2011). The well-preserved ophiolitic sequence provides important information on melt extraction, melting, and melt-rock interaction in the upper mantle of paleo-oceanic lithosphere (e.g. Kelemen et al., 1992; Zhou et al., 2005; Arai et al., 2007; Dilek et al., 2007; Dai et al., 2011), and thus offer critical clues to the tectonic setting of the ophiolite complexes (e.g. Karipi et al., 2006; Pagé et al., 2009; Pearce and Robinson, 2010).

The Yarlung Zangbo suture zone (YZSZ), which separates Eurasia to the north from the Indian plate to the south, can be divided into eastern, central and western segments. The western part is further divided into the Dajiweng-Saga ophiolite zone in the north and Daba-Xiugugabu ophiolite zone in the south (Yang et al., 2011). The studied Cuobuzha ophiolite is located in the north part of the western YZSZ . The mantle peridotites mainly consists of harzburgites and associated dikes or veins of gabbro in the massif. The Fo values of the olivines in mantle peridotites are high, the orthopyroxenes are mainly enstatites, and the clinopyroxenes are endiopsides and diopsides. Chrome spinels are characterized by high Al (Cr#=22-39) and high Mg# (60-70). The harzburgite in Cuobuzha have similar rare-earth element patterns, characterized by slightly depleted LREE and weak enrichment in HREE with $(La/Yb)_N$ = 0.11-0.60. Fractional melting modeling indicates that harzburgites may be the residues from 15%-20% melting. However, the LREE contents of the Cuobuzha peridotites are higher than the calculated LREE contents. This, in combination with their enrichment of large ion lithophile elements (LILE, e.g.Rb and Sr) and high field strength elements (HFSE, e.g.Ta, Hf and Ti), indicate that these rocks originated by partial melting of a mantle source which was later modified by fluids and melts in a suprasubduction zone mantle wedge. The diagram of Cr# vs. TiO2 in spinels (Fig. 1) is particularly effective in distinguishing partial melting from melt–rock interaction (e.g. Arai, 1992; Zhou et al., 1996). The Cuobuzha harzburgites deviate from the melting trend, and point to MORB or MORB to island arc tholeiite (IAT) spinel compositions. We can thus best explain this trend by interaction between

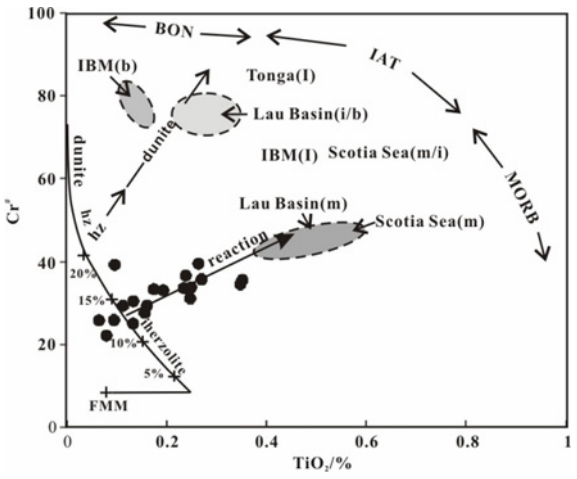

Fig.1 A plot of TiO_2 against $Cr^{\#}$ for spinel from Cuobuzha peridotites (modified after Pearce et al., 2000).
The diagram discriminates between partial melting trends (modelled) and melt–mantle interaction trends (drawn empirically). FMM refers to fertile MORB mantle, IBM to Izu–Bonin–Mariana. Subscripts m, i and b refer to the MORB, island arc tholeiite (IAT) and boninite (BON) chemistries, respectively, of the arc-basin lava spinel reference data.

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a harzburgite residual mantle and diverse types of magmas generated in a supra-subduction zone context. Comparative study of the western YZSZ suggest that the tectonic setting of the two ophiolitic sub-belts are similar: it may be the tectonic emplacement which resulted in the differences between them.

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