Geochemistry and tectonic significance of peridotites from the Kiogar ophiolite, SW Tibet

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The Kiogar ophiolite in southwest Tibet forms part of the Indus-Yarlung Zangbo suture zone that marks the collision between the Indian continent and the Lhasa Block of Eurasia (Ganseer 1964; Aitchison *et al*. 2003). The ophiolite is dominated by a mantle sequence of clinopyroxene(cpx)-bearing harzburgite, dunite, olivine orthopyroxenite and chromitite with trace amount of gabbronorite. The dunite pods and dykes cut the cpx-bearing harzburgite and are characterized by U-shaped REE patterns, low incompatible element abundances and high Cr# (0.74-0.80). This is in contrast to the cpx-bearing harzburgites that display upward spoon-shaped REE patterns with low incompatible element abundances and low Cr# (0.37-0.55). Trace element modelling shows that the cpx-bearing harzburgites represent the residues of 15-20% partial melting. The compositions of cpx compare well with those of abyssal peridotites. Using field, textural and geochemical evidence, we suggest the Kiogar ophiolite formed in a two-stage process. The cpx-bearing harzburgites originated from melting of a MORB-source at a ridge, which were subsequently modified to dunites by interaction with boninitic melts in a supra-subduction environment. The modified lithosphere was emplaced onto the deformed Mesozoic continental margin sequence of the north Indian plate prior to the closure of Neo-Tethys in the Paleocene.

References

Aitchison, J.C., Davis, A.M., Abrajevitch, A., Ali, J.R., Badengzhu, Liu, J., Luo, H., McDermid, I.R.C. & Ziabrev, S.V. Stratigraphic and sedimentological constraints on the age and tectonic evolution of the Neo-tethyan ophiolites along the Yarlung Zangpo suture zone, Tibet. In: Dilek, Y. & Robinson, P.T. (eds) Ophiolites in Earth History. Geological Society of London, Special Publications, 218, 191-206.

Ganseer, A. 1964, The geology of the Himalayas: New York, Wiley Interscience, 289pp.

Geochemical analyses using a benchtop polarized beam XRF spectrometer

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Principle of polarized-beam XRF spectrometry

X-rays scattered through an angle of close to 90º are strongly plane polarized. Most of the background in XRF spectrometry results from the scatter of the "continuous spectrum" (*Bremsstrahlung*) produced in the X-ray tube. The fluorescent X-rays used for analysis, of course, originate in the sample. Polarization of the primary X-rays in a plane at a right-angle to the sample largely eliminates the background. The analytical precision and detection limits are thereby enhanced.

Measurement of X-ray photon intensities

Si(Li) detectors have been have been used in polarized beam spectrometers since the first commercial instruments were developed. Silicon drift detectors (SDD) are a modification of the Si(Li) that show some dramatic improvements in performance. The SDD require only moderate cooling (~–30ºC) that can be achieved electrically. They can measure much higher intensities, up to 10^6 cps, and there are significantly fewer detector artefacts, particularly in the newer versions. Their disadvantage is that they are very thin and therefore relatively inefficient for elements such as Sn, Ba and the REE in the K spectrum.

An SDD polarized beam XRF spectrometer

The XEPOS instrument incorporates a recently developed SDD in a benchtop XRF spectrometer. A 50 W X-ray tube produces radiation from a very small area (1 mm x 1 mm). For the lightest elements a divergent beam of Pd Lα radiation from that "point source" can be focussed onto a sample using curved graphite that diffracts the beam at close to 90º, so that the beam incident on the sample is strongly plane polarized. We will report data obtained with this instrument; some Na and Rb contents for reference materials are listed here, measured on fused glasses and powder pellets, respectively.

	% Na_2O			ppm Rb	
	cert.	meas.		cert.	meas.
DTS-2	0.027	0.030	AN-G	1.0	1.1
SCo-1	0.90	0.94	UB-N	4.0	3.5
BIR-1	1.82	1.94	MRG-1	8.5	8.2
PM-S	2.08	2.07	BE-N	47.0	46.3
GSP-2	2.78	2.77	AC-E	152	148
GS-N	3.77	3.75	GH	390	382
AGV-2	4.19	4.09	FK-N	860	871
AC-E	6.54	6.47	Mica-Mg	1300	1301
AL-I	10.59	10.64	MA-N	3600	3614