5.1.P04

Kimberlites – a candidate to indicate the chemical state of the lower mantle

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Kimberlites are ultrabasic rocks characterized with its unique chemical compositions, including relatively abundant volatiles (H2O, CO2, halogens) and incompatible elements. It is well known that kimberlites generally contain diamonds together with many other kinds of mantle xenoliths, suggesting its derived depth to be more than 150km. Based on Nd-Sr isotope systematics, kimberlites are □rouped as Group I and Group II [1]. Group I kimberlites show the 143Nd/144Nd and 87Sr/86Sr ratios which are close to the Bulk Earth compositions, whereas Group II kimberlites have the characteristics of the enriched mante in the Nd-Sr systematics.

Concerning the depth of their magma source, several hypotheses have been proposed such as the asthenosphere, the bottom of the upper mantle, the lower mantle and the core-mantle bundary. Although solid isotopes cannot specify the preferred one among the inferred sources, we have demonstrated that the high 3He/4He ratios observed in kimberlites from southern-west Greenland suggest its source to be similar to those of OIBs [2]□If the OIB source is located in the lower mantle as generally considered, it is possible that the magma siurce of kimberlites would be also located in the lower mantle. This bears a very important significance that kimberlites might reflect the chemical state of the lower mantle.

Kimberlites include much larger amount of Ir than MORBs and OIBs. Furthermore, PGE patterns for kimberlites are known to be relatively unfractionated compared to those in C1 chondrites, whereas those in MORB and OIB sources are highly fractionated. This requires some carrier for PGEs in kimberlite magmas and sulfides are the most likely candidate. The apparent difference in PGE patterns between kimberlites and OIBs would reflect different magma transport processes to the surface. Kimberlites represent less oxidized state of the magma source than rocks of the upper mantle origin. This might imply that the lower mantle might be less oxidized than the upper mantle.

References

[1] Smith, C.B. *Nature* **304,** 51-54.

[2] Tachibana, Y., Kaneoka, I., Gaffney,A., and Upton, B. *GCA* **67,** A463.

5.1.P05

The Gadag greenstone belt, Western Dharwar Craton: Evidence of plume related and enriched magmas

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The Gadag greenstone belt contains volcano-sedimentary assemblages ranging in age from 2.6 to 2.44 Ga. The lithology is dominated by low-K and Fe-enriched mafic volcanic flows intercalated with high MgO basalts, rhyolites, andesites, dacites, shallow to deep water clastic and chemical sediments. The basalts having 5-11% MgO show mantle normalized signatures with slight LREE depletion, through nearly flat to LREE and trace element enriched. High MgO basalts with 12-19% MgO are strongly LREE and trace element depleted with limited crustal contamination, similar to the mafic-ultramafic association in Red Lake greenstone belt, Superior Province [1]. The close association of high MgO basalts with a complete sequence of bimodal volcanic suite, sedimentary assemblages and the strong contrast in their trace and REE profiles are consistent with their derivation in at least two stages: firstly from an entrained upper mantle source and followed by a lower crustal source melted by a plume in an island arc and active continental margin tectonic setting.

References

[1] Tomlinson, K.Y, Stevenson, R.K, Hughes, D.J, Hall, R.P, Thurston, P.C. and Henry, P.A. (1998) *Precamb Res* **89,** 59-76.