Origin of Yunnan potassic rocks: Re-Os isotope evidence

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Post-collision, potassic magmatism is a common feature in many collisional orogens around the world. Western Yunnan potassic magmas (ca. 40 to 30 Ma) are believed to have formed in response to convective thinning of the lithosphere. Major, trace, and Sr, Nd, and Pb isotope data in Yunnan potassic lavas have been interpreted to reflect derivation from a phlogopite-bearing lithosphere mantle source region that has been modified by subduction-related processes [1, 2].

We report here preliminary Re-Os isotopic results of potassic rocks collected from the Jianchuan and Erhai area and both sides of the northern Ailao Shan – Red River fault, west Yunnan. Total Os concentrations range from 0.004 to 1.4 ppb, and Re concentrations range from 0.01 to 0.769 ppb, with ^{187}Re/^{188}Os ratios varying from 0.59 to 283. Age-corrected ^{187}Os/^{188}Os ratios range from 0.13339 to 0.77661. In accord with major and trace element and Os isotopic characteristics, these samples are divided into three groups. Group A has very high MgO (21%) and ^{187}Os/^{188}Os$_i$ (0.17317) higher than depleted SLCM, OIB or MORB sources, and may be derived by high degree melting of a strongly metasomatized lithospheric mantle source. Group B has lower MgO (5-8%) and lower ^{187}Os/^{188}Os$_i$ ratios (0.133 to 0.140) but high Os concentrations (0.8-1.4 ppb), and may be derived from lower degrees of melting of a less strongly metasomatized lithospheric mantle source. These samples have Os isotope signatures within the range of potassic rocks from Brazil, southeastern Spain, the Tibetan Plateau, the Colorado Plateau and southwestern Arkansas, which also have been attributed to lithospheric mantle sources. Group C has much lower Os concentrations (0.004-0.036 ppb) and high ^{187}Os/^{188}Os$_i$ and ^{187}Re/^{188}Os ratios (0.459-0.777 and 112-283, respectively), interpreted either as crustal melts or magmas contaminated by crustal assimilation.

References

[1] Chung S. L. et al. (2001) *Geology* **25**, 311-314.
[2] Xu Y. G. et al. (2001) *Geology* **29**, 863-866.

Compound specific D/H isotopic composition of Orgueil and Murchison Insoluble Organic Matter

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Insoluble Organic Matter (IOM) constitutes the major part of organic matter in carbonaceous chondrites. Bulk isotope composition of D, C and N, determined by stepwise pyrolysis revealed large enrichments interpreted as the signature of an interstellar origin but also pointed to a lack of homogeneity in the isotope composition of the IOM. It is thus especially important to determine the isotope composition at the molecular level. However, unlike soluble compounds, only few data are published on compound specific isotope ratios of IOM building blocks. This is likely because the latter have first to be recovered from IOM thanks to degradation. Indeed, IOM consists of highly substituted small aromatic units cross-linked by branched aliphatic chains. Recently, a ^{13}C GCirMS study on pyrolysis products of Orgueil and Murchison IOM, i.e. on the aromatic moieties, led to values consistent with bulk data and showed that ^{13}C isotope composition of the IOM is not homogeneous at the molecular level. However, no similar study was carried out so far on the hydrogen isotope composition of the IOM and the aforementioned work only dealt with the aromatic moieties.

We here report a Deuterium GCirMS study on both the aliphatic linkages and the aromatic units of Orgueil and Murchison IOM. The aromatic units have been extensively characterized by pyrolysis-GC-MS but no precise information was available on the aliphatic linkages. To this end, the latter were released through ruthenium tetroxide oxidation, which is able to oxidize the aromatic units without degrading the aliphatic substituents.

We thus obtained the first molecular information on the aliphatic linkages in chondritic IOM. Their chain length is short (up to 7 carbon atoms), branched and comprises ether or ester functions. The high level of cross-linking was demonstrated by the occurrence of chains linking three aromatic units. The D isotope composition of the oxidation products confirmed a strong enrichment in Deuterium and showed some heterogeneity in the values. In a parallel study, pyrolysis products are being analysed in a same way. Comparison of the values should provide a clue on the relationship between aliphatics and aromatics in chondritic IOM.