Elemental and isotopic fractionation in some organs of bamboo

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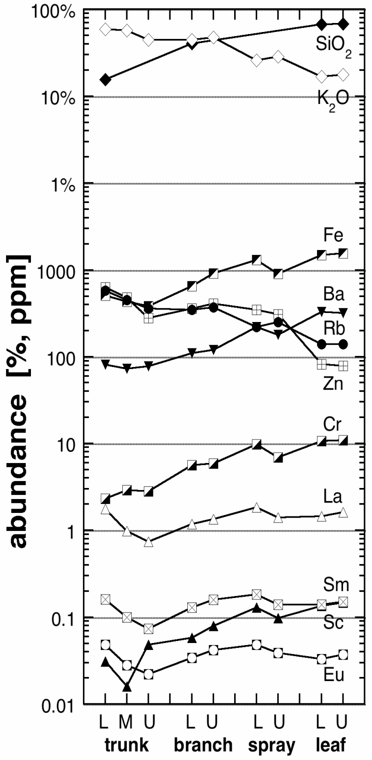
Chemical and isotopic compositions are useful tracers to assess the growing environment for plant life. Bamboo is one of the plants providing chemical and isotopic fractionation due to its long fibriform organs. Fu *et al.* (2001) and Ding *et al.* (2003) reported difference in REE and Si isotope compositions among organs of bamboo.

A bamboo (*Phyllostachys nigra* Munro var. *henonis* Stapf) with 7m high was collected in campus of Nagoya Univ. It is cut into lower trunk, middle trunk, upper trunk, lower branch, upper branch, lower spray, upper spray, lower leaf and upper leaf. After the reducing in ashes, elemental abundances and isotopic compositions are measured by INAA, XRF and surface ionization mass-spectrometry with double spikes (Wakaki *et al.*, this vol.).

Samples are reduced to ashes about 0.5wt% (trunk) to 4wt% (leaf) from raw bamboo. The most abundant element in trunk ash is potassium. Potassium abundance is richer in trunk (60wt%) and lower to leaf (17%). The contrasting is silica. Silica is richer in leaf (68wt%) and lower to trunk (16%). No other elements than these two are enriched in bamboo more than 10wt%. Zn and Rb show similarity in trend to K_2O. Iron , Ca, Sc, Cr, Co and Ba abundances are decreasing from leaf to trunk like that of SiO_2. No clear trend is found in REE and Cs abundances. These features are summarized in the figure. The grouping of the elements seems independent on ionic radius, ionic charge or solubility in water. Isotopic compositions of heavy elements will be discussed.



Co-precipitation of Sr^{2+} with calcite from 5 to 40°C

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Trace elements may fractionate during $CaCO_3$ crystallization. Degree of fractionation can be used as a proxy to reconstruct e.g. precipitation environments. CO_2 Diffusion Technique is used to crystallize calcite. The aim is to decipher temperature, precipitation rate (R), and solution chemistry effects on Sr^{2+} incorporation.

Sr incorporation into calcite was studied at various R values and T = 5, 25, and 40ºC. Results show that (1) at constant T elevated R results in less Sr discrimination in calcite, (2) at constant R lower T yields less Sr fractionation, (3) R effect is enlarged at lower T, (4) an upper limit for Sr incorporation exists at 40ºC, and (5) besides T and R effect Sr co-precipitation is influenced by solution chemistry (i.e. pH).

Complex Sr incorporation behaviour can be reasonably explained by the surface enrichment model (e.g. Watson, 2004). According to this model, Sr is significantly enriched in a surface layer of the growing calcite. Sr incorporation into the final calcite crystal lattice depends on crystal growth kinetics, value of Sr enrichment factor, and ion diffusion within the proposed surface layer.

Reference

Watson, E.B. (2004) *Geochimica et Cosmochimica Acta* **68**, 1473-1488.