In situ lithium isotope measurements for spodumene using LA-MC-ICP-MS

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As a useful geochemical tracer, the lithium isotope system has been used to study some important geological or geochemical problems. Lithium isotope can be readily fractionated during geological processes in nature because of the large mass difference (16.7%) between its stable isotopes, 6Li and 7Li, whose abundances are 7.52% and 92.48%, respectively. Therefore, the application of the lithium isotopic system has important significance in the fields of cosmochemistry, continental crust weathering processes, oceanic crust thermal activity and alteration, continental plate subduction and crust-mantle material recycling, surface water geochemistry, halogenic water origin and evolution, and so on. Therefore, this technique will surely become a useful geochemical tool in the Earth sciences.(Tian *et al*, 2012)

In this study, we have developed a direct *in situ* lithium isotope analytical method for spodumene using LA-MC-ICP-MS. Our LA-MC-ICP-MS homogeneity testing results show that the four in-house spodumene standards have constant ^{7}Li/^{6}Li compositons. The precision of measured δ^7Li in these homogeneous spodumene is better than 1.5‰. And all of these *in situ* analytical results are in good agreement with those results measured by solution MC-ICP-MS method within error.

Stable isotopic record of a Himalayan ice core during the last millennium

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A 108.8 m ice core to bedrock recovered from the East Rongbuk (ER) Glacier (28.03 N, 86.96 E, 6518 m a.s.l.) on the northeast ridge of Mt. Qomolangma (Everest) provides a high-resolution stable isotopic record of the last millennium (3044 samples). Interpretation of the Himalayan ice core δD and δ^{18}O records is multivocal. For instance, Thompson *et al* [1] suggested that the long-term δ^{18}O variability recorded in the Himalayan Dasuopu ice core was attributed to changes in local temperature, while Cai *et al* [2] suggested that precipitation, rather than temperature, was a major factor controlling δ^{18}O in precipitation on orbital time scales in the south-central Tibetan Plateau. However, the linear combination of δD and δ^{18}O (i.e., deuterium excess or $d=\delta D-8\delta^{18}O$) is a good proxy for changes in atmospheric circulation in the Himalayas [3]. A feature for the *d* time series of the ER ice core is the significantly positive phase during the period of middle 15th century and the significantly negative phase during the period of middle1] Thompson *et al* (2010). Science 289, 1916-1919. [2] Cai *et al* (2010). Geology, 38(3), 243–246. [3] Pang *et al* (2012). Climatic Research, 53(1), 1–12. 18th century, with a reversal around middle 17th century (Figure 1). This might indicate a changeover of the atmospheric circulation regime during the 17th century. We suggest that, on the centennial time scale, the Indian Summer Monsoon weakened since the early 15th century, reaching its minimum around the middle 17th century. The time interval of the 15-17th centuries is the transition from the Medieval Climatic Optimum to the Little Ice Age, and the modification of the atmospheric processes in the Asian monsoon regime may be the reflection of global change in the climatic processes during this time interval.

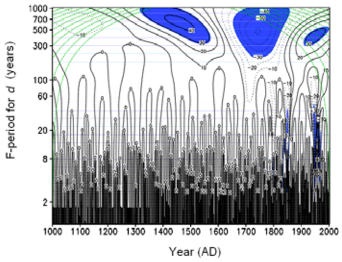

Figure 1. Result of wavelet analysis of *d* (solid lines stand for positive values, dotted lines for negative values, and dashed lines for the boundary effect. The shadow denotes the area passing the significant test with confidence of 95**.**

[1] Thompson *et al* (2010). Science 289, 1916-1919. [2] Cai *et al* (2010). Geology, 38(3), 243–246. [3] Pang *et al* (2012). Climatic Research, 53(1), 1–12.

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