

## REE Geochemistry in the weathering front of red residua underlying dolomites in Pingba county, Guizhou Province

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Chemical weathering of rocks is a major geological process, which modifies the Earth's surface and controls geological cycling of elements, thereby controlling REEs distribution in weathering front as well. This paper reported an unusual enrichment REEs at the upper saprolite–bedrock interface in dolomite weathering profiles at Pingba, Guizhou Province. In order to understand the formation mechanism of the REEs enriched bed and the fractionation between the REE, chemical leaching experiment and the extraction of the insoluble residues from dolomite was made at room temperature on the base of the analysis of main elements and trace elements. It is believed that the unusual enrichment REEs at the weathering front was yielded by three factors: (1) an inheritance of residuum weathered by dolomite, (2) a leaching accumulation of some light rare earth elements from the upper part of profile, and (3) an accumulation of secondary mineral of rare earth phosphates formed by weathering of primary phosphor-containing mineral distributed in dolomite inhomogeneously, which was considered as the most important factor. Our results support such a conclusion that the weathering profile represents a large, continental elemental storage reservoir, such as REEs enrichment under favorable conditions in terms of stable tectonics, low erosion and rapid weathering over sufficiently long time.

## Oxygen isotopic composition of IVA iron meteorites and its implications

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Oxygen isotopic compositions of silicate inclusions in IVA iron meteorites were measured with in-situ UV laser microprobe technique to test homogeneity within and among mineral grains. The oxygen isotope fractionations between coexisting mineral pairs were utilized to derive the oxygen isotope thermometry in each sample.

$\Delta^{17}\text{O}$  values from Steinbach for bronzite and tridymite are 1.24 and 1.18 ‰, respectively, from Sao Joao Nepomuceno for bronzite and tridymite are 1.22 and 1.25 ‰, respectively, and from Gibeon for tridymite and quartz is 1.06 ‰ in average. The standard deviations are less than 0.05 ‰. All  $\Delta^{17}\text{O}$  values are characteristic of a single reservoir and are consistent with previous data in the same range from 1.02 to 1.26 ‰. Our measured  $\Delta^{17}\text{O}$  values fully confirm the oxygen isotopic similarity between IVA irons and L/LL chondrites and supported the ideas that L/LL chondrites were the precursor of the parent body of IVA irons.

The  $\delta^{18}\text{O}$  values exhibit a normal mass-dependent fractionation between tridymite and bronzite in Steinbach and Sao Joao Nepomuceno with apparent oxygen heterogeneity. The average  $\delta^{18}\text{O}$  values of bronzite are  $3.9 \pm 0.2$  ‰ (n=15) in Steinbach and  $4.0 \pm 0.1$  ‰ (n=24) in Sao Joao Nepomuceno. For tridymite, they are  $5.4 \pm 0.3$  ‰ (n=7) and  $6.0 \pm 0.4$  ‰ (n=2) in Steinbach and in Sao Joao Nepomuceno, respectively. On the contrary,  $\delta^{18}\text{O}$  values from tridymite and quartz in Gibeon are homogeneous ( $6.94 \pm 0.05$  ‰, n=6). Oxygen equilibrium temperatures are estimated at around 1050°C for Steinbach and 900°C for Sao Joao Nepomuceno. The significant oxygen isotope heterogeneity both in tridymite and bronzite is probably due to oxygen exchange during cooling controlled by grain sizes and mineral abundances in local region of the samples. The fast grain boundary diffusion model for oxygen thermometry shows the cooling rate of Steinbach is 100 times that of Sao Joao Nepomuceno. This estimate highlights the necessity for reevaluating the thermal evolution of IVA irons.

### References

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