

Cu isotope fractionation during weathering of basalt

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Weathering is an important geochemical process which links lithosphere, hydrosphere, atmosphere and biosphere. Knowledge on isotope fractionation during weathering is crucial in using isotopes to trace element cycling during this important process. Cu is an element of particular biological and environmental interests. However no investigation on Cu isotope fractionation during weathering has been reported so far.

A laterite profile produced from basalt weathering in Huguangyan district Zhanjiang city, Guangdong province was chosen for Cu isotope study. Soil samples were collected from 0 (topsoil) to -7m (bedrock) depth downward. Cu isotope compositions were measured using Nu Plasma HR MC-ICPMS after digestion and chemical purification.

The $\delta^{65}\text{Cu}$ values obtained from the profile show a general increase with the degree of weathering, with $\delta^{65}\text{Cu}$ value of -0.25‰ for the bed rock basalt, increased to 0.21‰ for laterite near the top. However, the Cu isotope composition of top-most samples became lighter.

This observation shows that light isotope of copper is preferentially leached during chemical weathering. The light isotope enrichment of the top-most samples may be explained by effects of vegetation. As plants favor light Cu isotope, recycling of the plant materials into the soil causes decrease in $\delta^{65}\text{Cu}$ values.

The results presented above show that Cu isotope composition of laterites can be an index of the degree of weathering, but effect of plant on Cu isotope fractionation in topsoil of the weathered crust should also be considered.