

## Mobilization and isotope fractionation of chromium in Ni laterites, Indonesia

AKANE ITO<sup>1</sup>, DR. TSUBASA OTAKE<sup>2</sup>, KATSUYUKI YAMASHITA<sup>3</sup>, ADI MAULANA<sup>4</sup>, KENZO SANEMATSU<sup>5</sup>, SUFRIADIN<sup>4</sup>, TSUTOMU SATO<sup>2</sup> AND PROF. MASA HARU TANIMIZU, PHD.<sup>1</sup>

<sup>1</sup>Kwansei Gakuin University

<sup>2</sup>Hokkaido University

<sup>3</sup>Okayama University

<sup>4</sup>Hasanuddin University

<sup>5</sup>Geological Survey of Japan, AIST

Presenting Author: itouakane0330@gmail.com

Nickel laterite which is an economically important resource for Ni forms by chemical weathering of ultramafic rocks under tropical to subtropical conditions. This oxidative weathering also leads to break down of Cr(III)-bearing minerals (silicates and oxides) and subsequent oxidation of Cr(III), resulting in the release of toxic Cr(VI) from laterite profile to runoff [1]. Chromium stable isotope has been used as a tracer for redox processes in both anthropogenic and natural environments [2]. To better understand the factors affecting mobilization of Cr(VI) in the Ni laterites, we investigated geochemical characteristics including Cr isotopic composition ( $\delta^{53/52}\text{Cr}$ ) of two laterite profiles with contrasting weathering intensity developed on the serpentinized peridotite in Sulawesi, Indonesia.

In both profiles, the saprolite horizons exhibit similar Cr contents and  $\delta^{53/52}\text{Cr}$  values (-0.15‰ to -0.01‰) with the bedrocks (~-0.13‰), indicating minor Cr mobility, while the surface samples are depleted in Cr with isotopically light Cr compositions (~-0.40‰) relative to the bedrocks. These results suggest that intensive weathering has removed isotopically heavy Cr(VI) from weathering profiles, leaving light isotopes in near surface. Our isotope data for primary Cr(III)-bearing minerals separated from bedrocks indicates that Cr-spinel, known as weathering residual phase, has been broken down, which may contribute to the source of isotopically heavy Cr(VI). In contrast, the laterite horizons show different Cr isotope behavior between the two profiles. In relatively less weathered profile, middle part of laterite horizon is enriched in heavy isotopes (~+0.18‰), whereas the highly weathered profile shows almost similar  $\delta^{53/52}\text{Cr}$  values throughout the profile. The former case can be explained by the transport of isotopically heavy Cr(VI) generated in near surface downward and subsequent adsorption by Fe-(oxy)hydroxides. For the latter case, the limited isotope variation may be due to the reduction of Cr(VI) by organic matter and/or  $\text{Fe}^{2+}$  as indicated by the Fe isotope data. The present study shows that the intensive chemical weathering has led to decomposition of the Cr(III)-bearing minerals and Cr(VI) mobility may be controlled by the different redox conditions in near surface.

[1] Delina et al. (2020), *Chem. Geol.* 558, 30, 119863. [2] Qin and Wang (2017), *Rev. Min. Geochem.* 82, 379-408.