Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)
©2015. Japan Geoscience Union. All Rights Reserved.

HCG35-06 Room:105 Time:May 27 10:30-10:45

Geochemistry and Clay mineralogy of Paleosols in the middle Miocene Tokiguchi Porcelain Clay Formation

HATANO, Nozomi[1*] ; YOSHIDA, Kohki[2] ; ADACHI, Yoshiko[3]

[1]Division of Science and Technology, Graduated School of Shinshu University, [2]Development of Geology, Shinshu University, [3]Faculty of Science, Niigata University

The middle Miocene Tokiguchi Porcelain Clay Formation is fluvial deposits distributed in Aichi to south-eastern Gifu Prefecture (Akamine, 1954; Nakayama and Todo Collaborative Research Group, 1989). This formation is mainly composed of clay-silt with lignite and that is known as a high quality resource of ceramics (Fujii, 1967). Most previous studies had focused on the clay mineral composition and the parent materials so as to imply the mechanism and the timing of genesis of clay minerals (ex. Fujii, 1968; Tanemura, 1964). In general, clay mineral composition of sediments, however, is affected by parent materials, sorting of specified minerals during erosion, transportation and deposition and the chemical weathering after the deposition. The Tokiguchi Porcelain Clay Formation includes apparent paleosols that were formed by the physical, biological and chemical modifications of sediments and exposed at the earth surface. The paleosol horizons, thus, provide detailed information related to paleoweathering regimes. In this study, accordingly, we aim to clarify the relation among geochemistry, clay mineral composition, sedimentation and development of the paleosols in the Tokiguchi Porcelain Clay Formation.

The sedimentological measuring was performed in three mines, where were distributed within a radius of 5 km, across Tajimi to Toki Cities in Gifu Prefecture. The formation, besides, exposes as 15 to 30 m thick succession in these mines.

The sedimentary facies associations indicate that depositional environments was mainly in lake, swamp and marsh. Furthermore, approximately 20 paleosol horizons can be recognized in each mine. These paleosol horizons are characterized by various pedogenic features, such as root fossils over 150 cm in length, apparent soil horizons which include A, B and C horizons and microfabric of clay minerals.

The clay mineral assemblage of fine deposits is composed of almost kaolinite, expandable clay minerals, mica clay mineral and chlorite. There are no significant relationship between the clay mineral assemblage and the soil horizons, but the clay mineral assemblage is correlatable to the grain size of the sediments.

Geochemical approach indicates the variation of the parent materials in each horizon. In some horizons, the chondrite-normalized REE patterns show significant negative Eu anomaly and enrichment of LREE, which mainly suggest the provenance of felsic parent rocks. Whereas, in the other horizons, the REE patterns show slight negative Eu anomaly and gentle slope of LREE. The sediments of these horizons are characterized by the high expandable clay minerals/kaolinite ratio and yielding chlorite. In addition, the chemistry and clay mineral composition suggest the major provenance of mafic parent rocks.

The Chemical Index of Alteration (CIA index; Nesbitt and Young, 1982, 1984) shows high chemical weathering degree as a whole clay-silt samples from 88 to 95. In the surface soil horizons, furthermore, the paleoweathering ratios are higher than that in the sub-surface soil horizons. Thus, the chemical paleoweathering had been progressed in the soils after the deposition.

Though, the geochemistry shows the provenance variety in each horizon of the Tokiguchi Porcelain Clay formation, intense chemical weathering had masked provenance variety. In consequence those results suggest the progression of paleoweathering on the hinterland and after the deposition in the Tokiguchi Porcelain Clay Formation.

Reference

Akamine, 1954, Misc. Rep. Res. Inst. Natural Resources, **34**, 25-39.
Nakayama and Todo Collaborative Research Group, 1989, Monograph Assoc. Geol. Collaboration Japan, **36**, 237-246.
Fujii, 1968, Rep. Geol. Surv. Japan, **230**, 1-15.
Fujii, 1967, Bull. Geol. Surv. Japan, **18**, 1-19.
Nesbitt and Young, 1982, Nature, **299**, 715-717.
Nesbitt and Young, 1984, Geochimica et Cosmochimica Acta, **48**, 1523-1534.
Tanemura, 1964, Rep. Geol. Surv. Japan, **203**, 1-40.

Keywords: paleosol, chemical weathering, Miocene, chemical composition, rare earth element, clay mineral composition