

Weathering of granitic rocks of northern Abukuma Plateau: Application to forensic geology

Ritsuko Sugita[1]; Kazunori Arita[2]

[1] NRIPS; [2] Earth and Planetary Sci., Hokkaido Univ.

Granitic rocks, which are widely exposed to the ground surface and main constituent of the crust, are well studied from various points of interests. Granitic saprolite so called masa, considered to be developed by deep weathering, is distributed around the areas of granitic bodies. Surface soil has been mainly studied by pedologists for agricultural usage, but masa is coarse and less abundant in plains where suitable for cropping. Therefore it has not been studied well comparing to fresh rocks or other types of. In the field of forensic geology, research work has been mainly carried out on soil from A layers in which clay minerals are dominant, so that clay mineralogical techniques have mainly applied for the discrimination work. But grains of masa are usually coarser than other types of soils and contains smaller amount of clay minerals, which makes examination difficult.

The aim of this study is to apply the results of regional geological study and already existing data of granitic rocks to forensic geology to develop better discrimination methods of such matters.

Study area is Tokiwa and Ogoe Towns, Fukushima Prefecture which locating in the northern Abukuma Plateau where old granitic bodies are exposed. There were red and white masa, and fresh granitic rocks were often included in masa layers as core stones. White masa was sometimes observed underneath the red and white masa layer. Red masa was found only at the altitude between about 500 and 600 m.

Cracks and clay veins, whose widths were approximately from 1mm to 1cm, were observed vertically and/or horizontally in almost every outcrop in the area. Clays were white, pale pink, pale orange or yellow and often accompanied by blackish colored maters, which were, considered to be manganese wads. In some of the outcrops, pink albites had been formed along clay veins with several centimeters widths. Cracks and clay veins were cutting primary mineral grains, and biotites along clay veins were extremely altered. Core stones were about several meters in diameters and had onion structure. Boundaries of masa and core stones were apparent and at least some of them were formed by cracks filled with white clays. Fresh granitic rock in the area was hornblende-biotite granodiorite with glomeroporphyritic texture of mafic minerals, which often included small opaque minerals, monazites, zircons and apatites. Red and white masa were divided clearly by cracks and/or clay veins but some of the boundaries did not have any visible substances between those two.

There were microcracks in rocks, along which chloritization of mafic minerals, sericitization in plagioclase, and crystallization of epidote group minerals and titanites were observed. Plagioclase in masa was altered to clay minerals and only trace of zoning was observed. According to alteration degree, biotite layers were getting lose to change into clay minerals. The color was also getting pale from deeper brownish color of fresh biotite as well as birefringence was getting lower and some layers showed even bright green color. Cementing matter of red masa was reddish comparing to white one but altered primary minerals did not have significant difference.

From the result of micro XRF mapping analysis, cementing substance of red masa showed slightly higher iron content than the white one. EPMA was carried out on biotite and hornblende and the results were compared to other regions. As the result, hornblende from both fresh rock and masa did not show significant difference in major elements. It is considered that it was resistance to alteration, and could be useful to compare the origin of masa if found related to a crime. Concentration of iron and magnesium in biotite were decreased by alteration but their ratio was not changed very much as described by Hiraoka 1997 for the discrimination of soil. There will be a possibility of area estimation if the composition of primary minerals of granitic rocks were known.