Pyrrhotite Formation Around Granite Intrusion -Examples from the Ohsumi Peninsula and Yakushima Island, SW Japan

Yuzuru Yamamoto[1]; Toshitsugu Yamazaki[2]; Hideki Mukouyoshi[3]

[1] Inst. Geosciences Shizuoka Univ.; [2] MRE, GSJ, AIST; [3] Geology., Kochi Univ

Ferrimagnetic pyrrhotite (Fe7S8) has been known as quite stable magnetic mineral under anoxic environment. Because of rare existence of the pyrrhotite in the present sediments, it has been thought that pyrrhotite might be formed by anoxic reaction of magnetite with pyrite in the following diagenesis. This presentation examined the paleomagnetic study in the southern Kyushu, SW Japan and will focus the pyrrhotite magnetization obtained from the Ohsumi Peninsula and Yakushima Island.

NE-SW trending Eocene Shimanto accretionary complex is well exposed in the southern Kyushu between Ohsumi Peninsula, Tanegashima and Yakushima Islands. Sedimentary rocks suffered the contact metamorphism in the Ohsumi Peninsula and Yakushima Island because 14-13 Ma ilmenite series granite body emplaced in both area. On the other hand, thermal effect associated with granite intrusion is quite small in the Tanegashima Island because it is enough distant from the granite body. Vitrinite reflectance show progressive increase of temperature as close to the granite contact from 250 to 320 degrees, whereas 150 to 200 degrees in the Tanegashima Island.

Principal component analyses show the following three patterns. (1) Three components type: low temperature component under 250 or 300 degrees, middle component from 250 or 300 to 350 degrees, and high component over 350 degrees. The low and high temperature components show parallel and coincidence with the present-day geomagnetic direction. On the other hand, the middle temperature component shows westerly deflected declination of approximately 35-40 degrees with positive and negative inclination. (2) Sudden drop type: specimens were not demagnetized below 300 degrees of temperature or rarely obtained weak component parallel to the present-day field direction. They were demagnetized completely in the range from 300 to 350 degrees. The components show westerly deflected declination of approximately 35-40 degrees with positive and negative inclination. (3) One component type: they show a component gradually demagnetized during whole temperature range, parallel to the present-day field direction. All components of previous three types fail fold test.

Existence of magnetite and pyrrhotite in the metamorphosed Shimanto belt in the Ohsumi Peninsula and Yakushima Island were shown by low temperature magnetometry. On the view of the temperature range of previous principal component analyses, counter-clockwise components obtained from 250 to 350 or 300 to 350 degrees show pyrrhotite magnetization, whereas the other temperature range components parallel to the present-day field direction show magnetite magnetization. The characteristic component of pyrrhotite magnetization ranges from 300 to 350 degrees of temperature was not obtained from the Tanegashima Island where is enough distant from the granite body.

Magnetite recognized mainly in weathered micro-plane along micro-crack and cleavage under the micro-scopic observation. Therefore, magnetized should be formed and magnetized recently might through meteoric water. On the other hand, pyrrhotite develops mainly along pressure solution cleavage. In spite of pressure solution cleavage also develops in the Tanegashima Island, pyrrhotite was not recognized there indicates that emplacement of granite body operates largely on the pyrrhotite formation. The granite body does not contain pyrrhotite based on low temperature magnetometry. It indicates possibility that pyrrhotite was formed in-situ of sedimentary rock associated with thermal effect of granite emplacement, not derived through fluid from granite body. Existence of positive and negative inclination with counter-clockwise declination preserved in pyrrhotite indicates that formation and magnetization of pyrrhotite must continue during geologic time scale. It is reasonable to cooling rate of granitic magma 100 degrees / few Ma.