Paleomagnetic and rock magnetic study of serpentinite, gabbro and thier reaction rim of Iwagura area, Tokushima, Southwest Japan

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Serpentinites are formed from peridotites with hydrothermal alteration and the process accompanies the crystallization of magnetites. Serpentinite outcrops may be observed along tectonic zone (e.g., the Kurosegawa Tectonic Zone). The Serpentinites in the Kurosegawa Tectonic Zone are accompanied by rock bodies of various ages (serpentinite melange). Hirauchi (2006) reported that serpentinites in the Kanto Mountains are suggesting a continuous deformation during solid-state intrusion along the fault zones after undergoing serpentinization at deeper levels such as lower crust and upper mantle, from microtextures and combinations of serpentine minerals. Furthermore, Kamiya et al. (2010) revealed that there are zone of serpentinized peridotite over the subducting Philippine Sea Plate and suggested that the serpentinite bodies in the Kurosegawa Tectonic Zone were transported from forearc mantle wedge with deformation.

Serpentinite bodies in Iwagura area, Tokushima are distributed intermittently over 20km with east-west trend, and these serpentinite bodies accompany blocks of metamorphic rocks and gabbros. They are member of the Kurosegawa Terrane (Murata, 2003). In the outcrop of the present study, serpentinite and gabbro bodies are in contact with each other, forming reaction rims between them. We ovserved the paleomagnetic and rockmagnetic properties of serpentinites, gabbros and reaction rims.

Progressive thermal demagnetization, alternating field demagnetization, thermomagnetic analysis and low-temperature measurement have been performed on samples of serpentinites, gabbros and reaction rims. Results of thermomagnetic analysis and low-temperature measurement show that the predominant magnetic carrier for serpentinites is magnetite and those for gabbros are titanomagnetite and titanomaghemite. The magnetic carrier for reaction rims is titanomagnetite.

Alternating field demagnetization of serpentinite shows that more than 80% of the initial intensity was removed by 20 mT. Remanent magnetization for gabbros was not completely demagnetized by 100 mT during alternating field demagnetization. A single magnetic component was observed from gabbros and reaction rims and directions of the component from the two rock types are close to each other. Serpentinites have a single magnetic component and its direction differs from those for gabbros and reaction rims.

Thermal demagnetization of serpentinite shows multiple components of remanent magnetization. Directions of the highest-temperature component are well clustered. A single magnetic component was observed from reaction rims and its direction is statistically identical to the direction of reaction rims from alternating field demagnetization. Two magnetic components, with unblocking temperatures of 350C and 540C, are observed for gabbros during thermal demagnetization. Direction of the lower-temperature component is close to that for reaction rims, and direction of the higher-temperature component has a direction with negative inclination. The results suggest that the lower-temperature component of gabbros was acquired at the same time when reaction rims acquired their magnetic component.