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EARTH EVOLUTION SCIENCES UNIVERSITY OF TSUKUBA
筑波大学 地球進化科学

地質学セミナー

Petrological Study of Jurassic Bimodal Magmatism along a Collisional Orogen in the North China Craton

（北中国クラトンの大陸衝突帯におけるジュラ紀バイモーダル火成活動の岩石学的研究）

発表者①　小林　愛理　（岩石学分野 M2）

The North China Craton (NCC) is known as a collage of several Archean microcontinents amalgamated during late Paleoproterozoic to build the final cratonic architecture (Zhai and Santosh, 2011). The Trans-North China Orogen (TNCO) marks one of the major Paleoproterozoic collisional sutures, welding the Western and Eastern Blocks in the NCC. Several post-collisional plutonic complexes, which are often composed of both felsic and intermediate to basic magmatic rocks, have been reported along the TNCO. Such 'bimodal magmatism' often records complex magma mixing-mingling textures, which are probably a key for understanding sub-continental magma processes beneath the NCC as well as the post-collisional thermal evolution of the TNCO.

The Siganding pluton is an elongated oval-shape pluton with an area of 45 km2 and a length to width ratio of about 2:1, located along the western margin of the Eastern Block close to the TNCO. The pluton shows textural and compositional variation from the inner to the outer zones ranging from coarse-grained porphyritic monzo-granite at the inner zone to medium grained quartz monzonite in the transition zone, and fine-grained monzo-diorite at the periphery with several diorite porphyry dykes. The lithological differences indicate at least three stages of magmatism. The outer phase contains abundant mafic microgranular enclaves (MME) in outcrop, which suggests magma mixing/mingling processes during its emplacement. Such a bimodal magmatism and formation of the Siganding pluton has been regarded as an evidence of rifting (or lithospheric thinning) after the final collision of Eastern and Western Blocks of the NCC. The purpose of this study is to report new petrological, geochemical, and geochronological data of granitoids and associated MMEs of the Siganding pluton and discuss its petrogenesis related to post-collisional magma emplacement.

The MME is melanocratic, fine grained, and composed of Mg-hornblende, biotite, titanite, apatite and plagioclase, while the host monzodiorite mainly contains coarse-grained quartz, plagioclase, K-feldspar, Mg-hornblende to actinolite and biotite with or without titanite. Plagioclase in the contact zone between the MME and monzodiorite shows oscillatory and dusty zonings, which are regarded as typical characters of magma mixing processes (e.g., Perugini et al., 2003) (Fig. 1.). In the TAS plot, the granitoids fall in the alkali granite, granite, quartz diorite and syeno-diorite fields, whereas the MMEs are classified as syeno-diorite. Both the granitoids and MMEs show similar REE and trace elements patterns. In chondrite-normalized REE plots, both of them are characterized by high concentration of LREEs and relatively low contents of HREEs. In the primitive mantle normalized trace element pattern, they show negative Th, U, Nb, Ta and P anomalies and positive peaks of Ba, K, Nd, Sr and distinctly positive Pb anomalies characterized by a enrichment in LILE, and strong depletion in HFSE. Rb-Y-Nb and Rb-Yb-Ta diagrams of Pearce et al. (1984) for granitic rocks suggest that granitoids and MMEs are characterized by low Y, Yb, Nb, and Ta, and moderate Rb contents, which fall into the field of volcanic-arc granite.

The zircons from MME show weighted mean 206Pb/238U age of 156±2 Ma while those from host rock show slightly older but nearly consistent ages of 158±2 Ma to 162±2 Ma. Together with the field occurrences and petrographical evidences, it can be concluded that the Siganding pluton forms part of the major Mesozoic large igneous province associated with the thermal events which resulted in the decratonization of the NCC.

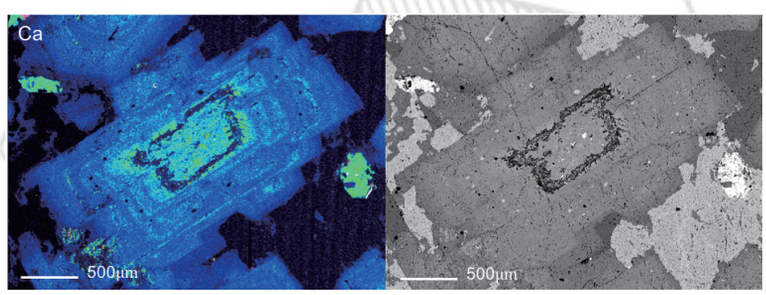

Figure 1. Oscillatory and dusty zonings of plagioclase phenocrysts from the host granite.