Paper Number: 4501

Phase petrology, geochemistry and U-Pb SHRIMP zircon chronology of Mylliem granitoids and microgranular enclaves from Meghalaya plateau, Northeast India: Evidence of synchronous crystallization, magma-mixing and mingling during Pan-African thermal orogeny

Kumar, S.[1*], Rino, V.[2], Hayasaka, Y.[3] and Terada, K.[4]

[1]Centre of Advanced Study in Geology, Kumaun University, Nainital 263002, India (skyadavan@yahoo.com)
[2] Department of Geology, Nagaland University, Kohima, India
[3] Department of Earth and Planetary Systems Science, Hiroshima University, Higashi-Hiroshima, Japan
[4]Department of Earth and Space Science, Osaka University, Osaka 565-0871, Japan

The Meghalaya plateau in northeast India is considered northeast extension of Precambrian Indian shield separated by a large-scale Garo-Rajmahal depression. Meghalaya plateau is dominantly composed of Proterozoic granite gneiss basement, migmatite, granulite, Cambro-Ordovician granitoid plutons and rocks of Mesozoic-Tertiary Groups. Mylliem granitoid pluton is one of the Cambro-Ordovician granitoid plutons, which intrudes the Shillong Group quartzites. Mylliem granitoids are medium to coarse grained equigranular and porphyritic granitoids containing megacrysts of K-feldspar embedded in medium to coarse grained matrix mainly composed of bt(±hbl)-pl-Kf-qz-mag-ttn-ap. Rounded to ellipsoid, mafic to hybrid microgranular enclaves showing fine to medium grained hypidiomorphic texture, sharp to crenulate contacts with host Mylliem granitoids are ubiquitous. Mineral assemblages of granitoids and enclaves are the same but differ in proportion. At places K-feldspar megacrysts and cm-sized microgranular enclaves together exhibit magmatic flowage texture. Both Mylliem granitoids and microgranular enclaves belong to magnetite to ilmenite series, metaluminous to peraluminous, high-K calc-alkaline granitoids formed in post-collision tectonic setting recognized based on magnetic susceptibility, biotite and whole rock compositions. Observed elemental variations of Mylliem granitoids and enclaves might have been controlled by combined mixing and fractionation.

Fifteen spots from fifteen zircons of a granitoid and seventeen zircons from fourteen zircons of an enclave were analyzed for U-Pb SHRIMP chronology. In CL images zircons from both granitoid and enclave are subhedral to euhedral commonly having 50µm width and 100µm length, and exhibit strong zoning patterns. Twelve concordant to nearly-concordant zircon spots from granitoid yield weighted mean $^{207}Pb/^{206}Pb$ age of 496.7±9.4 Ma (MSWD=1.8) whereas four most concordant zircon spots yield much precise $^{207}Pb/^{206}Pb$ age of 508.2±8.6 Ma (MSWD=0.85) as age of zircon crystallization in Mylliem granitoid. An inherited core of zircon from Mylliem granitoid provides 1134±15 Ma whereas in enclave 1452±34 Ma old core can be observed. These older ages imply recycling of Proterozoic basement which probably played significant role in the generation of Mylliem granitoids. Nearly-concordant to concordant zircons from enclave yield weighted mean $^{207}Pb/^{206}Pb$ age of 529±22 Ma (MSWD=4.9) whereas six most concordant zircons yield more precise $^{207}Pb/^{206}Pb$ age of 527±13 Ma (MSWD=0.23), which is more-or-less similar to the age noted for zircons of Mylliem granitoid, which underline that mafic (enclave) and felsic (host) magmas coexisted, and must be product of same thermal events. However, their sources and depth of origin may be different. Some zircons in enclave contain rounded (partially dissolved) cores, which appear inherited from protolith but interestingly determine the same

ages as noted for ages of rims. It is therefore inferred that these zircon cores were formed originally in granitoid melt and then transferred mechanically from host granitoid magma to a high-T hybrid magma zone during mixing event. Partial dissolution of zircons occurred in hybrid melt as a result of thermal rejuvenation and subsequently rims were grown over the partially dissolved cores in hybridizing magma system. Such cores are not seen in the zircons of Mylliem granitoids. Mylliem granitoids (508.2±8.6 Ma) and microgranular enclaves (527±13 Ma) were formed during a protracted thermal event related to mantle upwelling during Pan-African orogeny and remarkably coincide with the later stage of East Gondwana assembly (570-500 Ma).