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The Oldest Tonalite in South Korea: U-Pb Zircon Age of Ca.2.51 Ga

MOONSUP CHO[1], HYEONCHEOL KIM[1], YUYOUNG LEE[1],
KENJI HORIE[2], HIROSHI HIDAKA[2]

[1]*Seoul National University, South Korea*

[2]*Hiroshima University, Japan*

The Precambrian basements in South Korea are known to have formed as early as Late Archean, primarily based on depleted-mantle Nd model ages, but no outcrops of Late Archean or Early Paleoproterozoic age have been identified. We report a tonalite-granodiorite body found in Daeijak Island, western Gyeonggi Massif, which has been dated at ca.2.51 Ga, using the Sensitive High-Resolution Ion Microprobe (SHRIMP). In Daeijak Island, tonalitic to granitic intrusives are closely associated with amphibolites and leucocratic gneisses that show evidence for partial melting and migmatization. In particular, lots of mafic bodies are entrained as enclaves or breccias in agmatic migmatites. Amphibolites and leucocratic gneisses are strongly deformed and subsequently intruded by equigranular granitic dykes. The relationship between migmatites and tonalitic bodies is unclear. The analyzed tonalite consists primarily of green hornblende, biotite, muscovite, plagioclase, K-feldspar and quartz. Zircons occur as euhedral to subhedral grains of ca.50-200 μm. Zircon grains are commonly zoned, as revealed by cathodoluminescence images. The cores show oscillatory zoning which are inherited from magmatic zircons of an early episode. The rims, up to ca.70 μm thick, give bright luminescence. These rims are commonly structureless or show nebulous zoning, but provisionally interpreted to be magmatic because of their high Th/U values (ca.0.4-2.0). Some zircons also contain outermost rims (less than 10 μm) showing extremely bright luminescence but are too thin to be analyzed. The inherited cores of zircon, representing an early magmatic episode, gave ^{207}Pb/^{206}Pb ages of ca.2.57 to 2.62 Ga. Five spot analyses of rims from five grains define a concordant age group with the weighted mean ^{207}Pb/^{206}Pb age of 2508 $\pm$ 18 Ma. This zircon age is interpreted to date the latest Archean igneous activity in the Gyeonggi Massif. On the other hand, four spot analyses apparently define a discordia giving a lower intercept age of 850 $\pm$ 180 Ma. The lead loss during the Neoproterozoic is attributed to the regional thermal flux which was prevalent in the western Gyeonggi Massif. The occurrence of Late Archean tonalites suggests a tectonic correlation between the Gyeonggi Massif and North China Craton. In contrast, the Neoproterozoic signature is more correlative with the South China Craton. Further geochemical analyses are in progress to resolve this interesting dilemma and the result will be given at the meeting.