

Geochemistry of greenstones from Gorny Altai, southern Russia

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Gorny Altai is one of type locality of the Central Asian Orogenic Belts (CAOB). It is made up of Vendian-Cambrian island arcs, ophiolites, accretionary complexes and high P/T regional metamorphic rocks. Much of the basic rocks occur as greenstones, and they have various geochemical characteristics. It is important to clarify the tectonic evolution of CAOB. In this study, we discuss the tectonic setting of greenstones from accretionary and ophiolitic complexes, based on new geochemical and isotopic data and available constraints from geologic and petrologic studies.

Greenstones occur as the member of ophiolite unit and mappable (several m to 1km) blocks in basaltic clastic or serpentinite matrix. These are overlain or intercalated by micritic limestones, but without terrigenous sediments. This indicates that the greenstones were formed at shallow water in the mid-ocean region. These are divided into 5 groups based on geochemical feature; 1) LREE depleted pattern with slightly Nb depletion, 2) LREE depleted pattern with Nb depletion and low abundances in trace elements, 3) LREE enriched and HREE depleted pattern without Nb depletion, 4) slightly LREE enriched pattern with Nb depletion, and 5) LREE enriched and HREE depleted pattern with Nb depletion. Type1 greenstones correspond to the features between mid-ocean ridge basalt (MORB) and back arc basin basalt (BABB). Type2 and 3 greenstones are similar to BABB and oceanic island basalt (OIB), respectively. Type 4 and 5 greenstones are comparable with island arc basalt (IAB).

These are not aggregated blocks formed in each setting and must be generated in same setting, because some different type greenstones occur in same block. Recently, it is mentioned that a series of island arc evolution from initiation of subduction could generate the basalts ranged from MORB through IAB to BABB and boninite. This is one possible tectonic setting. Generally speaking, oceanic plateau basalt is geochemically homogeneous with E-MORB signature but some plateaus show geochemical heterogeneity. The basalts from Caribbean and Gorgona plateau have the REE pattern ranged from LREE depleted to enriched and some from Kuerguelen plateau have Nb anomaly. The second possible tectonic setting of greenstones is oceanic plateau above the lithosphere that remains subcontinental signature.