# PETROCHEMISTRY AND AGE DETERMINATION OF THE NEWLY DISCOVERED ECLOGITE IN THE WESTERN MONGOLIA

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This study report on newly discovered eclogite from the Western Mongolia in the Central Asian Orogenic Belt. Lenticular eclogite bodies with several meters in length are enclosed in quartzite of the Shubun/Urgamal formation in the southernmost part of the Zavkhan block which forms a part of the Neoproterozoic Tuva-Mongolian arc. Trace element patterns of eclogites are like those of OIB. We used relatively fresh eclogite sample and amphibolite sample to reconstruct the pressure-temperature history. Fresh eclogite preserves omphacite (with jadeite 38 mole%) coexisting with garnet ($Alm_{56}Gros_{35}Pyr_{8}$), barroisite, phengite (Si=3.36 apfu, O=11), quartz, epidote, rutile with accessory apatite, calcite, and hematite (assemblage 1). Garnet-core includes paragonite and kyanite coexisting with titanite, quartz, barroisite, which represents prograde stage mineral assemblage (Stage 0). The eclogite assemblages are variably retrogressed into amphibolite assemblage of hornblende, plagioclase, quartz, biotite, Mg-rich garnet-rim ($Alm_{61}Gros_{29}Pyr_{9}$), epidote and titanite (assemblage-2). In amphibolite sample, atoll-shaped garnet is ubiquitously observed. The atoll-shaped garnet consists of the eclogite facies core, Ca-rich mantle ($Alm_{53}Gros_{44}Pyr_{3}$) probably formed during the amphibolite facies stage 2, and a Ca-poor Mg-rich rim (or shell) ($Alm_{64}Gros_{25}Pyr_{10}$). The last Ca-poor garnet rim coexists with plagioclase, hornblende, epidote, quartz, titanite (assemblage-3). The earliest stage of metamorphism might happen in the "lawsonite stability field" if we interpret kyanite formed from paragonite. Subsequent Stage 1 P-T condition was determined at about 2 GPa and 480 ºC by garnet-clinopyroxene-phengite geothermobarometry. The eclogite once experienced decompression to the epidote-amphibolite assembalge equilibrated at ca. 0.8 GPa and 400 ºC during the Stage 2, determined by garnet-hornblende-plagioclase geothermobarometry. After the initial exhumation, the eclogite experienced heating to the high-pressure amphibolite stage 3 formed at ca. 600 ºC and 1.2 GPa. Such multiple P-T paths have been reported from eclogites from collision zones such as Sesia Alps and W.Tianshan. Additionally, we determined U-Pb age of zircon by CHIME method. Zircon typically exhibit oscillatory zoning and are sometimes included at the garnet core. Most zircons are severely altered, with rare fresh core only in large zircon grains (>0.1 mm). We obtained three populations of age at 1170 Ma, 680 Ma and 340 Ma for such zircon fresh cores. If we interpret these ages as igeneous protolith ages, the eclogite-facies metamorphism should have taken place after 340 Ma. Combining the metamorphic history and U-Pb zircon ages, we speculated that the eclogite primarily formed at the ocean island on the Mongol-Okhotsk (MO) ocean. If so, eclogite-facies metamorphism (assemblage 0→1) should have taken place when the MO plate subducted beneath the Siberian craton. Subsequently the eclogite probably separated from the subducting plate and come up to the crustal depth through the subduction channel, and was transformed into epidote-amphibolite assemblage (assemblage 2). Finally, continental collision took place when the N. China craton collide with the Siberian craton to close the MO ocean at 140 Ma, which transformed the rock to high-pressure amphibolite (assemblage 3).

Keywords: Eclogite, Central Asian Orogenic Belt, Mongol-Okhotsk Ocean

 