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Eclogite-Like Metagabbro of the Olkhon Terrane, West Baikal Area

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Abstract—Eclogite-like rocks of the Olkhon terrane correspond to two types according to the mode of occurrence and mineral compositions, although both types developed after the same type of gabbro of a single complex. The rocks of the first type are composed of garnet, clinopyroxene, pargasite (± scapolite, ± anorthite, ± spinel) and occur as thin veins or patches in the marginal parts of several small gabbro massifs of the Tonta Zone. The garnet is of almandine–pyrope–grossular composition and contains up to 40% of the pyrope end member. The rocks of the second type have been found in the Zamogoi Island in the Maloe More Strait. The island is composed of metasomatically altered gabbro cut by numerous granite and syenite veins. Carbonate and carbonate–silicate rocks compose dismembered veins and veinlets, as well as matrix embedding variably sized fragments of metasomatized gabbro and eclogite-like rocks in the southern part of the island. Based on the mode of occurrence and the presence of calcite–anorthite symplectite in some of the rocks, we suggest that the gabbro was penetrated by carbonate fluid or fluid–melt in a tectonic zone. The zone contains veins of garnet–clinopyroxene composition (varying from monomineralic garnetite to monomineralic pyroxenite) with minor pargasite, zoisite, anorthite, scapolite, and titanite. The garnet of Zamogoi Island has a grossular–almandine composition with a minor andradite concentration (about 10%). The compositions of minerals of the Zamogoi massif differ from the compositions of minerals in Tonta Zone, and the former are much more similar to skarn minerals.

Keywords: Olkhon terrane, collisional orogeny, eclogite-like rocks, gabbro, metamorphism, metasomatism, skarn, garnet, fassaite, scapolite

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INTRODUCTION

The western Baikal area hosts widespread metamorphic complexes of various composition, which are metamorphosed to various grade. Most of them belong to moderate- and low-pressure metamorphic series and were formed in the Early Paleozoic, at 500–440 Ma (Bibikova et al., 1990; Dobretsov and Buslov, 2007; Donskaya et al., 2013, 2017; Fedorovsky and Sklyarov, 2010; Fedorovsky et al., 1995, 2014; Gladkochub et al., 2014; Makrygina and Antipin, 2018; Sklyarov et al., 2020), although were initially thought to be of Precambrian age (Salop, 1967; and others). The territory also contains widespread gabbro and volcanic rocks, which characterize a subduction environment. However, high-pressure rocks (eclogites and blueschists), which are often exhumed from deep levels of subduction zones, have never been found at most of the territory and occur only north of the study area, in the North Muya (Shatsky et al., 1996, 2012) and South Muya subduction–collision zones (blocks) (Grudinin and Men'shagin, 1988; Doronina and Sklyarov, 1995; Skuzovatov et al., 2016) (Fig. 1).

For eclogite of the Muya block, temperature of metamorphism is estimated within the range of 590–740°C, whereas the lower limit of the crystallization pressure is 14–18 kbar according to the jadeite content in the pyroxenes (Shatsky et al., 1996, 2012). The granite gneisses hosting the eclogites are muscovite–biotite and biotite rocks and commonly contain garnet. The Sm–Nd ages of both the eclogites and embedding gneisses point to a Neoproterozoic age of the high-pressure metamorphism (~630 Ma). The model age (TDM) of the eclogites (720 Ma) is significantly different from the model age of the host gneisses (>1.3 Ga). According to (Avchenko et al., 1989), the equilibrium temperature of the eclogites was no higher than 600°C, and the pressure was 10–13 kbar.