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Studia breviora

Eclogites in the metamorphic complex near the village of Koshevo, East Macedonia

The metamorphic complex in the northern section of the Buchim structural block is part of the Precambrian basement of the Serbo-Macedonian Massif. The block consists of a variety of gneisses (amphibole-biotite, porphyroblastic, leucocratic, muscovite-biotite and other varieties), schists and amphibolites all of which probably belong to a common mixed formation. Eclogite bodies of various shape and size have been found near the village of Koshevo (some 25 km to the east of the town of Štip) hosted primarily in amphibole-biotite gneisses, amphibolities and schists, and in amphibole-biotite-muscovite gneisses.

В. Иванова (1984, unpublished) was the first to report eclogites from the area describing them as amphibole eclogites. The report has formed a basis for further studies which are the subject of this communication.

The eclogites form bedded bodies and lenses of irregular shape, and sheets traced over distances exceeding 1 km. They commonly occur in the cores of boudinage stuctures where their ovoid or lenticular bodies reach up to several meters in cross-section. Macroscopically, they are dark green fine-grained rocks of massive structure with red isometric garnet crystals up to 5 mm in size. The overall texture is porphyroblastic, and that of the groundmass is granoblastic.

The primary mineral composition of the eclogites includes garnet, clinopyroxene (omphacite), titanomagnetite and rutile. During the regional metamorphism into amphibolite facies, the original mineral assemblage suffered retrograde metamorphism which had produced a new mineral assemblage of hornblende, plagioclase, quatz, sphene, zoisite and magnetite. This process of replacement of the primary minerals by new regional-metamorphic products had affected unevenly the bulk of rocks.

Omphacite replacement started with the formation of submicroscopic symplectites of acid plagioclase and diopside around the rims of its grains. With the advance of the retrograde metamorphism, diopside had been gradually replaced by hornblende, and acid plagioclase had been transformed into larger andesine grains. Occasionally, small prismatic zoisite crystals had also formed during the amphibolization.

Garnet was more stable. It has left relics filled with alteration products overgrown by rims of clear, pure garnet and by kelyphytic borders of bluegreen amphibole oriented perpendicular to the garnet grains. Subidiomorphic magnetite is common among them.

Rutile had been replaced by sphene during the retrograde metamorphism.

A later stage of migmatization accompanied by an influx of alkalies and silica produced newly-formed feldspar and quartz, and hornblende transformed into biotite.

The eclogite transformations obey the following scheme: eclogite → garnet amphibolite → normal garnet-free amphibolite → amphibole (amphibole-biotite and amphibole-garnet) gneiss.

Two major stages may be distinguished in the metamorphic evolution of the eclogites:

First stage of high-pressure metamorphism; formation of the primary eclogite mineral assemblage of omphacite, garnet and rutile under high pressure, at moderate temperatures (corresponding to those of the amphibolite facies) and water potential.

Transitional stage of symplectite formation and structural decomposition of omphacite caused by decreasing pressure.

Second stage of medium-baric retrograde metamorphism into amphibolite facies; replacement of the primary mineral assemblage by hornblende, plagioclase, quartz, sphene and zoisite at moderate temperatures and pressures with water taking part in the reactions (increased water potential).

Late migmatization stage producing a new mineral assemblage of plagioclase, quartz and biotite.

The same sequence has been observed in the metamorphic evolution of the Rhodope Massif eclogites which occur in the Precambrian rocks of the Rhodope and Pre-Rhodope Supergroups (Kozhoukharova, 1980; Кожухарова, 1984[a,b]).

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