**Gedrite-anthophyllite bearing rocks from Eastern Rhodopes – main features and origin**

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**Introduction**

Orthoamphibole (gedrite and anthophyllite) bearing rocks are not uncommon, but they are not abundant in typical metamorphic belts. This mineral association has been reported only from metamorphosed ultramafic or basic magmatic rocks. We report data on gedrite-anthophyllite formation in more acid (SiO₂=69.1%) and aluminous (Al₂O₃=12.9%) rocks. The “strange” mineral composition implies many origins proposed for these rocks. There are three major hypotheses (Spear, 1993): 1) metasomatism accompanying metamorphism; 2) residuum of partial melt and 3) pre-metamorphic alteration by weathering or hydrothermal alteration by seawater.

**Petrology**

The investigated rocks belong to the Krumovitza Lithotectonic Unit (Sarov, 2012) which consists of different lithologies: marbles, gneisses, amphibolites, mica schists. A characteristic feature of the unit is the presence of large metaultramafic bodies incorporated at different stratigraphic levels. The rocks were metamorphosed under high temperature up to migmatization of the rocks. The continuation of the Krumovitza unit on the territory of Greece is known as Kimi complex. There, in garnet-kyanite gneisses from that complex has been discovered the first evidence for UHP metamorphism in rocks (microdiamonds, pseudomorphs after coesite) from the Rhodopes massif (Mposkos, Kostopoulos, 2001).

The studied rocks outcrop in the area around the village of Avren. They represent strongly schistose dark-grey rocks intercalated with white-grey impure marbles adjacent to a metaultramafic body. The mineral assemblage observed in the rocks comprises gedrite (dominant orthoamphibole), anthophyllite, garnet, staurolite, plagioclase, quartz, talc, rutile, cordierite, and accessories (apatite, zircon, opaque).

Fig. 1. Sharp contacts between gedrite (Ged) and anthophyllite (Ant) in quartz-plagioclase matrix, BSE image
erals are enriched in Mg, but not enough to be classified as magnesio-type. Their composition is determined by the bulk rock composition \(X_{Fe\_rock} = 0.39\) and this feature can explain the presence of talc in the rocks.

The plagioclase \((An_{16.3-20.1})\) forms dominantly large twinned porphyroblasts with abundant drop-like inclusions of quartz, idioblastic needle-shaped rutile and rare gedrite. Such texture may be a breakdown product of former mineral phase(s).

The garnet and staurolite \((X_{Fe} = 0.69–0.70)\) are relatively rare being observed as isolated resorbed grains replaced by chlorite.

The talc flakes occur in the foliation plane but they are never observed in contact with the orthoamphiboles.

The coexistence of gedrite and anthophyllite with garnet, staurolite and cordierite poses more questions than answers. In first place comes the question about the gedrite-anthophyllite solvus. Spear (1980) suggested that the solvus closes at approximately 600–625 °C at ≈ 5 kbar. Therefore, this assemblage in the studied rocks represents a later stage of their metamorphic evolution close to the peak of the solvus curve. The assemblage garnet+cordierite was formed at earlier stage and was probably stable up to 750 °C and ≈ 5 kbar. Above 5 kbar the assemblage sillimanite+gedrite (orthoamphibole) is stable according to the reactions: cordierite+garnet = sillimanite+orthoamphibole and cordierite+staurolite = sillimanite+gedrite. Unfortunately no evidence for HP metamorphism has been found in this case.

**Conclusion**

The investigated rocks have an unusual mineral composition and they represent polyfacies metamorphic rocks. The HT mineral assemblage includes garnet+cordierite replaced under MP conditions by the association gedrite+anthophyllite+talc. The occurrence of this assemblage was favored by the bulk composition of the rocks but a limited influence of the ultramafic body can be presumed, too.

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**References**


