



Ultra Sodic gedrite and micro-scale metasomatic processes in granulitised kyanite eclogites from the Rhodope UHPM Province, Greece

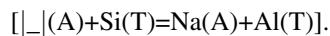
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The Rhodope Massif occupies most of northeastern Greece and southern Bulgaria and comprises high-grade metamorphic rocks such as metapelites with microdiamond inclusions. The (U)HP mineral paragenesis underwent extensive metamorphic overprint at granulite-facies followed by amphibolite-facies retrograde metamorphism.

A kyanite-eclogite that occurs as lenses in orthogneisses from Thermes village was used to unravel the pressure-temperature-time path of the (U)HP rocks from the Rhodope. The peak-pressure mineral assemblage is omphacite, garnet, kyanite, phengite, rutile, apatite and zircon. Quartz is absent from the matrix and it can be found either as inclusions in garnet or as post-peak veins. This late quartz contains primary and secondary fluid inclusions implying the presence of a fluid phase during post high-pressure metamorphism. Kyanite is never observed in direct contact with quartz being armoured by an intervening stripe of plagioclase which itself shows zoning, becoming increasingly albitic towards quartz. Plagioclase formation at the Ky-Qtz interface requires certain Na and Ca influx that was provided by matrix omphacite. Two types of symplectites were formed by reaction between omphacite and kyanite. Firstly, corundum+plagioclase symplectites were formed at the expense of the jadeitic component of omphacite during decompression. Subsequently, the residual diopsidic component of omphacite reacted with the already formed corundum to give rise to spinel+plagioclase symplectites. The previous mechanisms demonstrate metasomatism in the micro-scale by diffusion controlled processes. During decompression matrix omphacite was decomposed to amphibole+plagioclase symplectites which reacted with garnet to form coronas consisting of two amphiboles (ortho- and clino-), plagioclase, ilmenite and magnetite. Biotite and plagioclase are also found as symplectites replacing phengite during decompression. Thermodynamic modelling of the symplectitic domains that replace kyanite shows that the stability of these domains is sensitive to the effective local chemical composition; in addition, analysis of phase relationships demonstrated the existence of the observed assemblages at pressures lower than 1.3GPa.

The orthoamphibole identified in the garnet corona is sodic gedrite and classifies amongst the most sodic compositions published in the literature. Sodic gedrite is a phase commonly found in high-temperature metamorphosed rocks. The mechanism responsible for the incorporation of sodium in gedrite is the extensive edenite substitution:



Zircon U/Pb geochronology using SHRIMP II revealed an Eocene (42Ma) age for zircon recrystallisation. We suggest that the latter occurred during granulitisation. This age is in agreement with a coeval age obtained for apophyses of the huge Skaloti granitic batholith occurring in the area and is consistent with the evolutionary history of the Rhodope Massif undergoing general exhumation and crustal collapse in Eocene times.