

Stability of jadeite in UHP metamorphosed quartzo-feldspathic rocks, an example from the Bohemian Massif

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Stability of jadeite rich clinopyroxene is predicted for quartzo-feldspathic rocks metamorphosed under (U)HP conditions by experiments and thermodynamic modelling. However, jadeite is extremely rare in natural samples even though the UHP conditions are confirmed by index minerals as coesite or diamond. This inconsistency can be explained either by its complete consumption during exhumation, or a lack of its formation in the HP conditions. The latter could be explained either by fluid deficiency or overstepping of clinopyroxene-in reaction in HP conditions.

In this contribution, we describe a felsic meta-igneous rock from the Erzgebirge Mts. (Bohemian Massif) composed of garnet, kyanite, phengite, quartz, K-feldspar, and plagioclase. This rock documents UHP metamorphic conditions based on the coesite relics in garnet. In the matrix, fine-grained symplectites of albite and muscovite with occasional garnet are present. Similar textures were previously interpreted as pseudomorphs after jadeite [1] although in contrast to their work, our samples revealed several jadeite inclusions in kyanite and garnet. Averaged composition of the albite-muscovite symplectite corresponds to the composition of jadeite except for Na depletion and K enrichment.

Two garnet generations were observed: garnet 1 representing the main volume of the large crystals is almandine rich with rimward Ca and Fe decrease and Mg increase. It is enriched in Na and P with content increasing from the core followed by an abrupt drop at the rim, where a jadeite inclusion was observed. The Ca-rich and Na-P-poor garnet 2 occurs in the outermost rims of the large crystals and as small garnets in the albite-muscovite clusters.

Our observations document peak conditions in the coesite stability field with mineral assemblage Grt-Jd-Ky-Ms-Coe-Kfs. This stage was followed by partial decompression outside of the coesite stability but still within the jadeite stability (jadeite inclusion in P-poor garnet rim) and final break down of jadeite to albite and muscovite resulting in Ca-enrichment of the garnet rims.

Our study demonstrates an agreement between experiments and natural samples exposed to UHP conditions proving that jadeite is present in the felsic rocks in HP conditions, however it seems to disappear efficiently during decompression.

[1] Massonne (2024), *J Metamorph Geol* 42, 1159-1178.