



Water in eclogitic garnet and clinopyroxene with oriented quartz and pargasite inclusions, W Norway

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This study analyses the H₂O content in nominally anhydrous minerals (NAMs) in 10 eclogites from W Norway. Each sample has oriented lamellar to acicular inclusions in clinopyroxene, which are either quartz with pargasite or quartz/albite without pargasite [1]. Low-Al orthopyroxene and polycrystalline quartz inclusions in several of these samples provide evidence for UHP metamorphism in the stability fields of diamond and coesite. The H₂O content is quantified using Fourier transform infrared spectroscopy (FTIR), unpolarised infrared radiation, spectra deconvolution, and the calibration of [2].

Preliminary data was obtained from the analysis of the first 5 eclogites yield for garnet 22-379 and 16-31 $\mu\text{g g}^{-1}$ structural H₂O for samples with and without pargasite lamellae, respectively. The highest value occurs in a zoisite-bearing eclogite. If regarded separately, then the variation in the 4 zoisite-free eclogites shrinks to 16-32 $\mu\text{g g}^{-1}$ H₂O. Absorption bands characteristic for molecular H₂O in garnet (centered at wavenumbers $<3460\text{ cm}^{-1}$) were not observed. The ranges for structural H₂O in clinopyroxene from these 5 samples are 125-380 and 183-564 $\mu\text{g g}^{-1}$, respectively. The highest value occurs in a sample with intense recrystallization of clinopyroxene (but not garnet) after peak metamorphism. If regarded separately, then the total range is 125-380 $\mu\text{g g}^{-1}$ H₂O. The obtained clinopyroxene-garnet H₂O partition coefficient has ranges of 1.0-11.0 and 11.6-18.2, respectively. The extreme values belong to the zoisite-bearing (1.0) and the strongly recrystallized (18.2) samples. If regarded separately, then the total range is reduced to 3.9-11.6.

Combining the preliminary data of the quantified structural water with petrological information tends to suggest the following relationships. (1) The current H₂O content in NAMs is affected by the presence of hydrous minerals during peak metamorphism and the retrogression history. (2) The peak UHP garnet is water-deficient unless zoisite forms part of the mineral assemblage. (3) The current H₂O content of clinopyroxene (containing oriented inclusions of quartz with and without pargasite) from "diamond-facies" UHP eclogite is lower compared to that of "graphite-facies" UHP eclogite from a similar tectonic setting that lacks such inclusion microstructures [3]. (4) Samples with oriented inclusions of pargasite in clinopyroxene tend to have lower clinopyroxene-garnet H₂O partition coefficients than those without pargasite, which suggests that pargasite lamellae formed by clinopyroxene dehydration during early decompression. Additional data will be presented to test these preliminary indications.

This study received funding from Norway Grants 2014–2021 operated by the National Science Centre (Poland) under project contract no. 2020/37/K/ST10/02784.

[1] Spengler et al., 2023, *Eur. J. Mineral.* 35:1125-1147

[2] Bell et al., 1995, *Am. Mineral.* 80:465-474

[3] Gose & Schmädicke, 2022, *J. Metamorph. Geol.* 40:665-686