Aragonite: Crystallographically oriented fibres in eclogite-facies garnet from Corsica

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Aragonite, the high-pressure polymorph of calcite, occurs as a metamorphic index mineral in the lowest-grade low-temperature, high-pressure metamorphic terranes. The rapid kinetics of its back-reaction to calcite upon decompression makes its preservation an indicator of decompression under quite low temperatures, implying either anti-clockwise P-T paths or at least continuous cooling during decompression. There are indeed extremely few records of aragonite relics in relatively high-grade rocks, then as tiny inclusions in a rigid host mineral, which prevents expansion and transformation of the high-pressure carbonate polymorph, in the same way as it does for coesite or microdiamond.

We record here the occurrence and preservation of aragonite in eclogitic blueschists of eastern Corsica, showing a most uncommon microtexture. Aragonite exclusively (?) occurs as oriented rods in garnet crystals of a black calcite marble that immediately overlies serpentinite bodies of the meta-ophiolitic unit. The crystallographic control imparts to the garnet the appearance of a sector zoning, and the whole texture is very reminiscent of the crystallographically oriented intergrowths of either quartz or organic material ('graphite') already described in garnet of a few amphibolite-facies metamorphic terranes (Norway [1], Ireland). These observations and their significance will be discussed in the light of a detailed petrological description of these rocks, Raman imaging of the calcite/aragonite polymorphs in the sections and of Raman investigation of the abundant carbonaceous material of the samples. The bearing on the significance of other crystallographically oriented inclusions in (high-pressure?) garnet will be discussed as well.

References

[1] Andersen T.B. (1984), *Mineral. Mag.* **48**, 21-26.

The effect of paleozoic land plant evolution on atmospheric CO_2 and O_2

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Modeling, field and experimental studies, and proxy measurements support the idea that the rise and evolution of large vascular land plants, especially trees, during the mid-to-late Paleozoic had a profound effect on the biogeochemical carbon cycle. The development of extensive root systems brought about increased Ca and Mg silicate weathering and increased transfer of atmospheric CO_2 to dissolved bicarbonate and ultimately to marine carbonates. Atmospheric CO_2 was also removed as a result of increased burial of plant-derived organic remains, especially in the form of microbially resistant lignin. Increased weathering and organic burial led to a large drop in CO_2, helping, via the atmospheric greenhouse effect, to set the stage for the vast Permo-Carboniferous glaciation.

Increased organic burial also resulted in the increased production of O_2. This led to a Permo-Carboniferous maximum in atmospheric O_2 at levels possibly as high as 30%. This elevated O_2 likely contributed to an increase in the size of organisms, such as insects and amphibians, which breathe via various diffusive-like processes. During an approximately 20 million year period across the Permian-Triassic boundary, due to a decline in large land plant production that resulted in decreased terrestrially-derived organic burial, O_2 production declined and brought about a large drop in O_2. This drop must have been a contributing factor to the Permo-Triassic extinction.