



CSD of garnets as a function of metamorphic grade and composition in black marls of the Nufenen zone

K. Gauchat and L.P. Baumgartner

Institute of Mineralogy and Geochemistry, Humense, Université de Lausanne, CH-1015 Lausanne (Karine.Gauchat@unil.ch)

A garnet crystal size study of regional metamorphic rocks is presented. The studied area is the Helvetic Mesozoic cover sequence of the Gotthard Massif in the upper Rhone valley (Swiss Alps), between Nufenen Pass and Brig. We followed a graphite rich (up to 2%) meta-marl. The metamorphism varies from lower greenschist facies to lower amphibolite facies layer along this 35 km profile. The meta-marl mineralogy is garnet, plagioclase, clinozoisite, white mica, biotite, carbonates, pyrite, ilmenite, and accessories minerals such as zircon, titanite, rutile and apatite. Higher grade samples also contain amphibole.

The garnet prophyroblasts are idiomorph. They grew in a fine grained matrix. Their size ranges from a few millimetres to a centimetre. The resistance of garnet to erosion, the difference of colour between garnets and surrounding matrix, as well as the large exposed surfaces which reveal a large number of garnets make them good candidates for image analysis on outcrop scale.

High resolution pictures of the outcrops surfaces were taken using a digital camera parallel and perpendicular to the schistosity planes (2048pixels/1536pixels). This results in a resolution per pixel of roughly 0.0083 cm. The 2D garnet distributions and garnet shapes were determined using the Aphelion™ image analysis program. The diameters measured on the pictures were interpreted as maximum diameter whenever the garnets protruded significantly from the rock surface. In all other cases 2D data were converted to 3D data using the Saltikov correction method implemented in the CSDcorrection program of Higgins (2000).

All CSD's are slightly curved. CSD's from four different outcrops from the Nufenen Pass area show as large a variation as the overall variation obtained from outcrops

from middle greenschist facies to lowermost amphibolite facies. These variations seem to be related to small changes in bulk rock composition and mineral mode, such as plagioclase content. Nevertheless, garnets from the highest metamorphic grade, the Corno area, have larger crystal diameters. The differences observed in CSD slopes from low to high grade samples are relatively small. Hence care must be taken to compare garnet CSD's of rocks with very similar chemistry, since they are apparently a very sensitive function of composition.

Reference

Higgins, M. D. (2000): Measurement of crystal size distributions. *American Mineralogist* 85, 1105-1116.