ESRF	**Experiment title:** **Mineralogical profile and crystal structure refinements of rare minerals in metasomatic mineralizations in the contact zone of the Adamello batholit (central-southern Alps)**	**Experiment number**: CH-1807
Beamline: BM08	**Date of experiment**: from: 12/12/2004 to: 17/12/2004	**Date of report**:
Shifts: 15	**Local contact(s)**: Carlo Meneghini	*Received at ESRF:*

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Report:

The Adamello batholit is the largest Tertiary magmatic complex in the Alps. Its southern margin is in direct contact with the Triassic south–alpine sedimentary sequence, in which spectacular metamorphic, metasomatic and deformative phenomena connected with Alpine orogenesis and Adamello intrusion occurred. Among these, metasomatic veins and pegmatites are of great mineralogical and geological significance [1]. Metasomatic veins are small fractures (< 5 cm) of the dolomite marble filled with fluids related to the Adamello intrusion. These fluids have crystallized by reacting with the surrounding dolomite. In few centimeters an entire metasomatic zoned sequence is established. Moving from the center to the border of the veins, zones with different mineralization due to ion diffusion through the dolomite matrix, can be detected. Depending on the composition of the fluid phase, minor metallic and rare mineralization are also present [6]. The comprehension of the formation mechanism of these metasomatic veins can give insight not only on contact metamorphism but also on metasomatic ore minerals formation and on geochemical modeling of ion diffusion in rocks. The mineralogy of metasomatic veins has been studied in the past only by optical microscopy, wet chemical analysis and sometimes by electron probe microanalyses [3, 4, 5].
There is a substantial lack of information on the mineralogy from a crystallographic point of view. Moreover chemical analyses are often of scarce accuracy, especially in the cryptocrystalline zone in which the crystal size is often smaller than the probe used (i.e. electron beam). The knowledge of the crystal chemistry of the minerals involved in the metasomatic process can account for the transport mechanism in the veins, in this regard a debate is open on the role of diffusion and infiltration [2], and also for the geochemical, thermal and barometrical condition of the Adamello batholith formation. The change in the lattice parameters instead can be more useful for detecting chemical variation in a given phase arising in different mineralogical levels. Finally an accurate measurement of the quantitative distribution of the phases across the veins is fundamental for numerical modelling of metasomatism.We carried out preliminary laboratory XRPD and single crystal XRD studies, in order to identify the main phases present (dolomite, calcite, olivine, serpentine, amphibole, pyroxenes, epidote, prehnite, and minor molibdenite, hematite). However most of the layers are too thin to be sampled properly. A continuous scan across the vein is then mandatory, consequently we designed a synchrotron radiation diffraction experiment to be carried out at BM08 Gilda beamline. The samples examined are normal sections of the veins having dimension 5x2cm with a thickness in the range 1mm to 15 mm depending on the brittleness of the rock. The section mounted on a translating holder was moved perpendicularly to the vein axis with steps of 100μm (fig. 1). For every step a diffraction pattern was collected using a monochromatic beam having a cross section of 0.1 (v) x 2 (h) mm^2. This size is the best compromise between statistic and spatial resolution (the smallest mineral layers are approx. 0.2-0.5 mm in height). To speed up the process 6 diffraction patterns were collected on the same IP (fig. 2) using the translating IP set up [7] with the Ta slits widely opened. Preliminary Rietveld analysis of the collected diffraction patterns has revealed that the mineralogical variation across the veins can be followed not only qualitatively but also quantitatively (fig. 3).

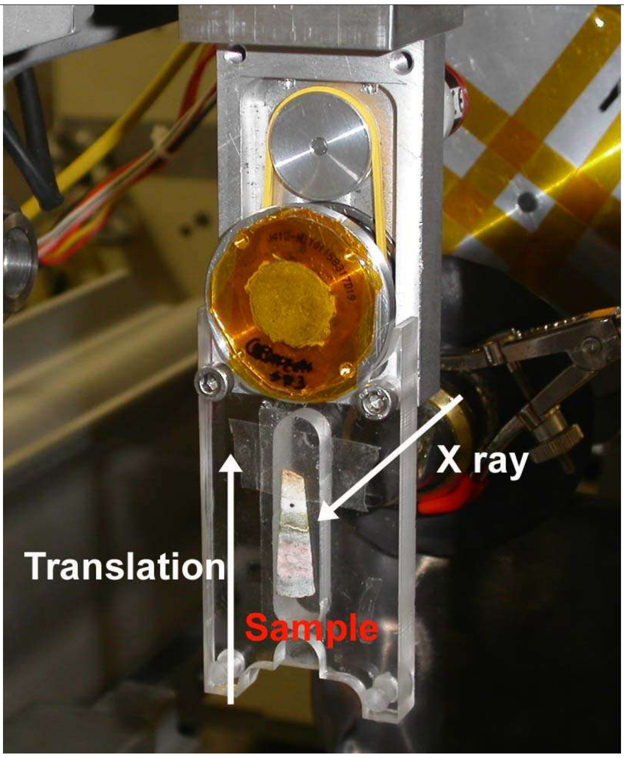

Fig1: Translating sample holder with a vein section mounted on.

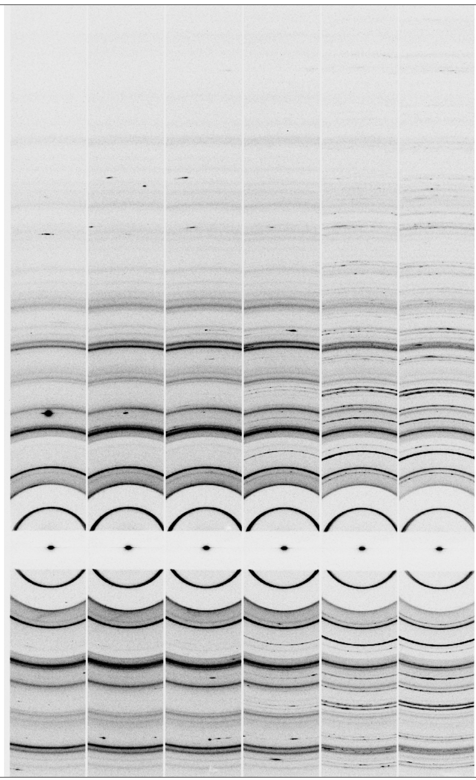

Fig.2 Sequence of 6 diffraction patterns collected every 100 μm across the transition between the carbonates area (right) and the serpentine area (left)

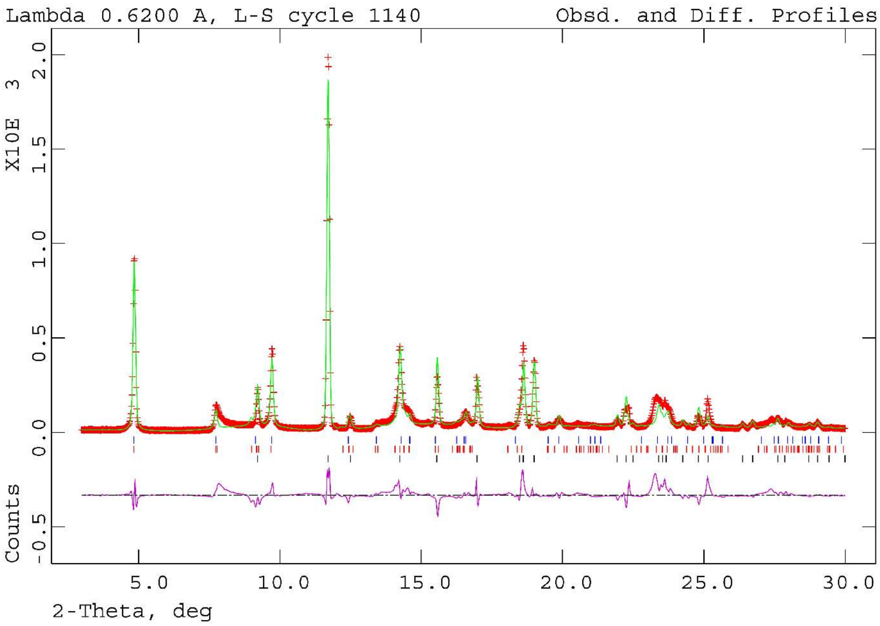

Fig 3: Rietveld refinement of the first diffraction pattern on the right of fig 2. Three phases can be identified: two politypes of lizardite (blue and red thicks) and calcite (black thicks)

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