Geophysical Research Abstracts, Vol. 7, 11028, 2005
SRef-ID: 1607-7962/gra/EGU05-A-11028

Neutron Texture Investigations of Minerals, natural Ice and Fossils

D. Chateigner (1) and **M. Zucali** (2)

(1) CRISMAT-ENSICAEN, CNRS-UMR 6508, 6 Bd Maréchal Juin, 14050 CAEN Cedex, France, (2) Dipartimento di Scienze della Terra Università di Milano, Italy (michele.zucali@unimi.it)

Neutron Quantitative Texture Analysis has been recognised for decades as a very powerful tool in examining rock deformation processes through fabric developments. More recently the Rietveld-Texture combined analysis [1] as given rise to even more interest in the use of neutrons, particularly for the study of polymineralic rocks.

After a brief review of this fairly recent methodology that will describe the many parameters accessible to nowadays neutron experiments, we will focus on four different examples of characterisation of rocks, ice and fossils:

- relationships between metamorphic and mineralogical evolutions of minerals and their deformation history, revealed by QTA and minerochemical studies, will be exemplified on amphibolitic metamorphic rocks [2],

- the grid-work textures of quartz formed in Siliceous-Crust-Type (SCT) horizons will be compared to Magadii-type (MT) chert textures, commonly interpreted as formed by Magadiite-mediated silica precipitation processes. Because of the strongly different genesis of SCT and MT formations, it will be shown the SCT do not form by a silica mediation [3],

- even in cases for which strong incoherent scattering occurs, for instance in neutron investigations of natural ice, it will be shown that texture information can still be extracted without the need of deuteration. Texture of a natural ice cube from the GRIP Greenland core has been analysed showing coherency of the generally admitted deformation processes for Greenland [4],

- mollusc phylogeny is affected by "missing" links that could be completed using extinct fossil species, which however do not allow DNA analyses. The mineralised remaining parts of the shells, fossilised or not, may provide in this case useful phylogenetic information. Textural parameters have been proved useful in the past [5] for phylogenetic purposes using x-ray analyses. However, for large species and grains, neutrons are more appropriate. This will be demonstrated on a Belemnite fossil analysis.

[1] D. Chateigner: "Analyse combinée par diffraction de rayonnements" (2004). http://www.ecole.ensicaen.fr/∼chateign/texture/combined.pdf, 86p

[2] M. Zucali, D. Chateigner, M. Dugnani, L. Lutterotti, B. Ouladdiaf: Quantitative texture analysis of glaucophanite deformed under eclogite facies conditions (Sesia-Lanzo zone, Western Alps): Comparison between x-ray and neutron diffraction analysis. "Deformation Mechanisms, Rheology and Tectonics: Current Status and Future Perspectives", de Meer S., Drury M.R., de Bresser J.H.P., Pennock G.M. Eds., Geological Society, London Special Publications 200, 2002, 239-253

[3] Camana G., Chateigner D., M. Zucali, Artioli G.: The grid-work texture of authigenic microcrystalline quartz in siliceous crust-type (SCT) mineralized horizons. The American Mineralogist 87(8-9), 2002, 1128-113

[4] D. Chateigner, P. Duval, O. Brisseau, B. Ouladdiaf: Determination of orientation distribution of antarctic ice using position sensitive detector diagrams. D1B-ILL experiment report n°: 5-26-119, juin 2000

[5] Chateigner D., Hedegaard C., Wenk H.-R.: Mollusc shell microstructures and crystallographic textures. J. of Structural Geology 22, 2000, 1723-1735