



Science Meeting – Scientific Report

The scientific report (WORD or PDF file - maximum of seven A4 pages) should be submitted online within two months of the event. It will be published on the ESF website.

Proposal Title: MicroDlce summerschool 2014 “Recrystallization mechanisms in minerals, metals and ice”

Application Reference N°: 5417

1) Summary (up to one page)

The aim of this summerschool was to gather european scientists around the specific topic of recrystallization mechanisms in materials.

Recrystallization (static, dynamic, post-dynamic) is a process occurring after or during deformation of minerals in the mantle, metals in forming processes, or ice during large scale flow. The physical processes associated with recrystallization can strongly modify the microstructure and the texture (fabric) of the materials, and therefore modify their mechanical properties and responses.

In order to better understand and simulate the recrystallization mechanisms, it is essential to provide a good insight into the basics of the mechanisms (grain nucleation, grain boundary migration, reduction of deformation stored energy...) from experimental point of view but also from post-mortem study of natural samples or industrial materials.

Although minerals, ice and metals are solicited in very different conditions, they can show very similar behavior concerning basic physical mechanisms of recrystallization. Nevertheless, approaches to study these materials can be various and complementary.

We therefore aimed at gathering the communities in order to provide a large overview on the tools and approaches developed in order to exchange and learn from each others.

This objective was successfully attained as can be observed from the invited speakers and the variety of the participant origins.

2) Description of the scientific content of and discussions at the event (up to four pages)

The summerschool mostly consisted into courses and workshops about the state of the art of knowledges on recrystallization in materials, observations techniques and

modelling tools, and specific application fields such as industrial materials, rocks and ice. Details of the courses given are provided in the following table.

After each course, a reasonable time of 15 to 20 mn was left for exchange and discussions which were lively and very interesting.

During workshops participants could initiate to EBSD analyses from electronic microscopy with MTEX and XX.

They could work with X-ray diffraction measurements to estimate dislocation densities on polycrystalline samples. A specific presentation of the capability of Diffraction Contrast Topography method was given during one of these workshops.

On the modeling side, workshops were focusing on mean-field modeling approaches to estimate nucleation and grain growth, and on a full-field approach that participant would play with in order to evaluate the role of various parameters on the predictions.

Discussion were taking place during lunches and diner as every participant was staying at the same place.

An excursion took place on thursday afternoon along the sea coast with a nice walk, descriptions of the site and anecdotes by our local guide, and a great swim in the Méditerranée.

Organizing and scientific committee: Maurine Montagnat, Andrea Tommasi, Roland Logé.

Website: <http://lgge.osug.fr/rubrique172.html>



3) Assessment of the results and impact of the event on the future directions of the field (up to two pages)

Feedbacks were very positive as people from each field of research (industry, rock mechanics, ice and snow) learnt from fields they were not familiar with and left with new insights about techniques to apply (modelling and experiment).

This event enabled young researchers from ice and snow field to access easily to the wild range of knowledge accumulated in material sciences about recrystallization. This knowledge is often too far from basic bibliographic work performed by young researchers working on ice and snow. They were also able to build closer links with some measurements, observations, and questioning from mineral studies.

On the other side, material scientists working on metals could also deepen their knowledge about ice and rocks and were very interested about the similarities, and what can be learnt from these natural materials. Indeed, ice once more clearly appeared as a good model material to understand basic mechanisms, both from controlled experiments and validation of modelling tools.

Discussions were made about a second version of this school to be organized within 2 years.

4) Annexes 4a) and 4b): Programme of the meeting and full list of speakers and participants

Annexe 4a: Programme of the meeting

<i>Day one</i>	<i>Description</i>
8:30 – 9:00	Welcoming
9:15 – 10:00	Introduction – Course 1 – R. Logé
10:00 – 11:00	Course 2-1 “Plasticity – Deformation heterogeneities - Recrystallization “ - J-H. Schmitt
11:15 – 12:15	Course 2-2 “Plasticity – Deformation heterogeneities - Recrystallization “ - O. Castelnau
12:30 – 14:00	Lunch break
14:00 – 15:00	Course 2-3 “Recrystallization – Mechanical properties” - B. Bacroix
15:15 – 16:15	Course 3-1 “Characterization tools for recrystallization mechanisms” part 1 – N. Bozzolo
16:45 – 17:45	Course 3-2 “Characterization tools for recrystallization mechanisms” part 2 - S. Zaefferer
<i>Day two</i>	<i>Description</i>
9:00 – 10:00	Course 4-1 “Modelling tools for recrystallization mechanisms” part 1 – F. Montheillet
10:00 – 11:00	Course 4-2 “Modelling tools for recrystallization mechanisms” part 2 M. Bernacki
11:30 – 12:30	Course 5-1 “Recrystallization in natural conditions: rocks and ice” part 1, A. Tommasi
12:30 – 14:00	Lunch break
14:00 – 17:00 (2 groups)	Workshop “2D characterization with EBSD and image analyses” A-L. Helbert, D. Mainprice Workshop “3D characterization with X-Ray diffraction and neutrons” A. Borbély, C. Le Bourlot
<i>Day three</i>	<i>Description</i>
9:00 – 10:00	Course 5-2 “Recrystallization in natural conditions: rocks and

	ice” part 2, M. Montagnat
10:00 – 11:00	Course 6-1 “Strategies and issues in metallurgical industry” part 1 – A. Perlade
11:30 – 12:30	Course 6-2 “Strategies and issues in metallurgical industry” part 2 - C. Poletti
12:30 – 14:00	Lunch break
14:00 – 17:00 (2 groups)	Workshop “2D characterization with EBSD and image analyses” A-L. Helbert, D. Mainprice Workshop “3D characterization with X-Ray diffraction and neutrons” A. Borbély, C. Le Burlot
<i>Day four</i>	<i>Description</i>
9:00 – 12:00 (2 groups)	Workshop “Full field modelling of recrystallization and grain growth” D. Solas Workshop “Mean field modelling of recrystallization and grain growth” D. Piot
12:30 – 14:00	Lunch break
Afternoon	Excursion
<i>Day five</i>	<i>Description</i>
9:00 – 12:00 (2 groups)	Workshop “Full field modelling of recrystallization and grain growth” D. Solas Workshop “Mean field modelling of recrystallization and grain growth” D. Piot
12:00 – 13:30	Lunch break
13:30 – 17:00	Poster presentations, discussions
END	

Annex 4b: Full list of speakers and participants

Speakers :

G. Gottstein (Germany) and M. Drury (the Netherlands) were supposed to give courses but had to cancel their participation at the last minute. We could only replace them by French speakers.

J-H. Schmitt (Lab. MSSMAT, Ecole Centrale, Paris, France)
O. Castelnau (Lab. PIMM, Paris)
B. Bacroix (Lab. LSPM, Paris)
N. Bozzolo (Lab. CEMEF, Mines ParisTech, Nice, France)
S. Zaefferer (Max-Planck-Institute for Iron Research, Duesseldorf, Germany)
F. Montheillet (Ecole des Mines St Etienne, France)
M. Bernacki (Lab. CEMEF, Mines ParisTech, Nice, France)
A. Tommasi (Laboratoire Géosciences Montpellier, France)
M. Montagnat (Laboratoire LGGE, Grenoble, France)
A. Perlade (Arcelor Mittal Research, France)
C. Poletti (Graz University of Technology, Austria)
D. Solas (University Paris Sud, France)
D. Piot (Ecole des Mines St Etienne, France)
R. Logé (EPFL, Lausannes, Suisse)
A-L Helbert (Université Paris Sud, France)
D. Mainprice (Laboratoire Géosciences Montpellier, France)
A. Borbély (Ecole des Mines St Etienne, France)
C. Le Bourlot (Laboratoire MATEIS, Lyon, France)

58 participants from 7 countries (including speakers and organizers).

Al Akhrass Dina
ATEBA BETANDA YANICK
Bacroix Brigitte
Barbatti Carla
Barou Fabrice
Bernacki Marc
Billia Marco
BILLOT Thomas
Binder Tobias
BLAIZOT Jérôme
Borbély Andras
BOZZOLO Nathalie
BureauRomain
Castelnau olivier
CHARPAGNE Marie-Agathe
Chauve Thomas
Dairon Jonathan
DANCETTE Sylvain
de CARLAN Yann
DEMOUCHY Sylvie
Flin Frédéric
FRESENGEAS Claude
HARY Benjamin
HAY Michael
HelbertAnne-Laure

HERMANT	Alexandre
Hidas	Karoly
HUVELIN	Zhao
Journaux	Baptiste
Kerch	Johanna
KRAJCARZ	Florent
Krol	Quirine
Kuiper	Ernst-Jan
LE	Lu Tuan
Le Bourlot	Christophe
LE CORRE	Sébastien
Llorens	Maria Gema
Logé	Roland
Mainprice	David
Montagnat	Maurine
Montheillet	Frank
Moussa	Charbel
Perlade	Astrid
PIOT	David
Poletti	Cécilia
Salmon-Legagneur	Hubert
Schmitt	Jean-Hubert
Scholtes	Benjamin
Smagghe	Guillaume
SOLAS	Denis
Steinbach	Florian
Taupin	Vincent
Tommasi	Andrea
Vaughan	Matthew
VERSTRAETE	Kévin
Wiese	Mareike
Zaefferer	Stefan
ZOUARI	Meriem