

# RESEAU FRANÇAIS DE MECANOSYNTHESE

## Lettre N°49

-----  
**Avril 1999**

**139 Groupes de Recherche**  
(dont 74 à l'étranger)

**Bureau : E. Gaffet (Président), G. Le Caër (Secrétaire Général), A.R. Yavari (Trésorier)**

### 2 Nouvelles Adhésions :

**M. Bououdina** - Dpt Materials - Queen Mary & Westfield College - Londres - Angleterre  
**F. Carli** - Vectorpharma SpA - Trieste - Italie

### Le site web du RFM est le suivant

**<http://www.bls.fr/amatech>**

Rubrique Pages Sciences et Techniques pour l'Ingénieur (Rubrique Sciences)

⇒ vous y trouverez les anciennes lettres du RFM (accessible par Adobe Acrobat)

les statuts du RFM ainsi que les annonces concernant les JRFM'99 et quelques éléments mis à jour régulièrement concernant les derniers résultats dans ce domaine.

=====

### ANNONCE DE CONGRES ET / OU ECOLES CONGRESS AND SCHOOL ANNOUNCEMENTS

=====

#### 4th International Workshop on Metastable Phases (IV IWOMP)

7 - 9 Avril 1999 - Bologne - Italie

Contact : Bonetti@df.unibo.it

Prof. Ennio Bonetti - Dept. of Physics, University of Bologna

Viale Berti Pichat 6/2 - I-40127 Bologna, Italy Fax: +39/051/6305153; E-mail: IWOMP@df.unibo.it

#### 12th International Conference on Wear of Materials

Atlanta - Georgie / USA - 25 - 29 Avril 1999

contact : Amy Richardson E-Mail A.Richardson@elsevier.co.uk

or web site : <http://www.elsevier.nl/locate/wom99>

#### Granulation et Séchage

17èmes Journées de l'AFSIA

11 - 12 Mai 1999 - ENSIGC Toulouse - France

Correspondance : D. Steinmetz - ENSIGC - 18 Chemin de la Loge -  
31978 Toulouse Cedex 4

#### Powder Metallurgy

Summer School

29 Mai - 4 Juin 1999 - Gothenburg - Suède

E-Mail : Info@epma.com

NOUVEAU

NOUVEAU

#### E MRS - Spring Meeting

1 - 4 Juin 1999 - Strasbourg - France

Web Site <http://www-emrs.C-strasbourg.fr>

Symposium A : Phot - Excited Process and Applications

Symposium B : Protective Coating and Thin Films 99

Symposium C : Progress in Computational Materials Science

Symposium D : Plasma and Ion Surface Engineering

Symposium E : Advanced Silicon Substrates

Symposium F : Process induced defects in Semiconductors

Symposium G : Material Physics Issue and Applications on Magnetic Oxides

Symposium H : Strain in Materials : Analysis, Relaxation and Properties

**Symposium I : Microcrystalline and Nanocrystalline Semiconductors**

Symposium J : Materials for Coherent Optics

Symposium K : Materials, Process and Technology for Optical Interconnect  
Symposium L : Ab - Initio Approaches to Microelectronics Materials...  
Symposium M Basic Models to enhance Reliability in Si based devices and ..  
Symposium N : Molecular Optoelectronics : Materials, Physics and Devices  
Symposium O : Chalcogenide Semiconductors for Photovoltaics  
Symposium P : Optical Characterization of Semiconductor layers and Surfaces

-----  
**JRFM'99**

4èmes Journées du RFM  
2 & 3 Juin 1999 - Dijon - France  
Web Site : <http://www.bls.fr/amatech> - Web SubSite : Sciences

-----  
**Nanostructured Materials Symposium at the 5th IUMRS International Conference  
on Advanced Materials  
(IUMRS - ICAM'99)**

Beijing - Chine - 13 - 18 Juin 1999  
Contact : [Kelu@imr.ac.cn](mailto:Kelu@imr.ac.cn)  
WebSite - <http://www.chimeb.edu.cn>

-----  
**PM2 Tec 98**

1999 International Conference  
on Powder Metallurgy and Particulate Materials  
Vancouver - 20 / 24 Juin 1999  
E-Mail : [Info@mpif.org](mailto:Info@mpif.org) - Website: [www.mpi.org](http://www.mpi.org)

-----  
**NATO Advanced Research Workshop on Nanostructured Films and Coatings**

June 29-30, 1999 - Santorini, Greece  
(Contacts: G.M. Chow, Department of Materials Science, National University  
of Singapore, Kent Ridge, Singapore 119260, FAX: +65-7763604, EMAIL:  
[mascgm@nus.edu.sg](mailto:mascgm@nus.edu.sg); I. Ovid'ko, Institute of Problems for Mechanical  
Engineering, Russian Academy of Sciences, Bolshoj 61, Vas. Ostrov, St.  
Petersburg 199178, Russia, FAX: +7-812-2178614, EMAIL: [ovidko@def.ipme.ru](mailto:ovidko@def.ipme.ru);  
T. Tsakalakos, Rutgers University, Department of Ceramics and Materials  
Engineering, Piscataway, NJ 08854, FAX: 732-445-3229, EMAIL:  
[tsakalak@rci.rutgers.edu](mailto:tsakalak@rci.rutgers.edu))

-----  
**4th Int. Conf. on Materials Chemistry**

13 - 16 Juillet 1999 - Trinity College \_ Univ. Dublin - Irlande  
Web Site : <http://www.rsc.org/conferences>

Themes :  
Inorganic Nano and Micro Particles  
Functional Polymers  
Magnetic Materials  
Organic Nanostructures  
Molecular Crystals and Crystal Engineering  
Computational Chemistry and Materials for Electronic

-----  
**Advanced Materials - Nanostructured Systems**

15 - 17 Juillet 1999 - Hong Kong  
1st workshop of the new IUPAC series :  
"New Directions in Chemistry  
Theory, Nanoparticles, Quantum Dots,  
Bio - Inspired Structures, Applications to Nanotechnology  
Organizing Committee A. El - Sayed - Georgia Tech - Atlanta - USA  
J. Portner - President of IUPAC - Tel Aviv - Israel  
N. Teng Yu - HKUST - Hong Kong  
S. Williams - Hewlett - Packard Co., California USA  
**Web Site** : <http://www.iupac.org/symposia/conferences/wam1>

-----  
**NATO Advanced Research Workshop**

Investigations and Applications of Severe Plastic Deformation  
2 - 6 Aout 1999 - Moscou - Russie  
E-Mail : [TLowe@lanl.gov](mailto:TLow@lanl.gov) and [Valiev@ippm.rb.ru](mailto:Valiev@ippm.rb.ru)

-----  
**IAC - 2**

2nd International Alloy Conference  
8 - 13 Aout 1999 - Davos - Suisse  
Website : [www.engfnd.org](http://www.engfnd.org)

**NOUVEAU**

-----  
**"Thermal Spray Processing of Nanoscale Materials II"**

15 - 20 Aout, 1999 - Quebec City, Canada  
(Contacts: C.C. Berndt, SUNY-Stony Brook, 306 Old Engineering, Stony Brook,  
NY 11794-2275, FAX: 516-632-8525, EMAIL: cberndt@notes.cc.sunysb.edu,  
WEBSITE: <http://www.engfnd.org>; E.J. Lavernia, EMAIL: lavernia@uci.edu; C.  
Moreau, EMAIL: christian.moreau@nrc.ca; M.L. Trudeau, EMAIL:  
trudeaum@ireq.ca; and L. Kabacoff, EMAIL: kabacol@onr.navy.mil)

-----  
**NANO 2000**

5th International Conference on Nanostructured Materials  
Sendai - 20 - 25 Aout 2000  
E\_Mail : nano2000@imr.tohoku.ac.jp

-----  
**RQ10**

**10th International Conference on Rapidly Quenched and Metastable Materials**

Bangalore - Inde - 23 - 27 Août 1999  
Wesite : <http://www.metalrg.iisc.ernet.in/rqten/>

-----  
**ISMANAM 99**

International Symposium on Metastable Mechanically Alloyed and Nanocrystalline Materials  
and Euro Conference on Gas Phase Synthesis of Nanocrystalline Materials.

Org. : L. Schultz, J. Eckert, H. Hahn  
Dresden - 30 Aout - 3 Septembre 1999  
E\_Mail : ISMANAM99@ifw-Dresden.de  
WebSite: <http://www.ifw-dresden.de/imw/ismanam/>

-----  
**SMM14**

14th International Conf. on Soft Magnetic Materials  
8 - 10 Septembre 1999 Balatonfüred - Hongrie  
web site : <http://www.kfki.hu> - Subsite : smm14

-----  
**EUROMAT 99**

20 - 30 Septembre 1999 - Munich- Allemagne  
E\_Mail : euromat@dgm.de  
Web Site : <http://www.euromat.fems.org>

-----  
**Int. Symp. Cluster and Nanostructure Interfaces (ISCANI)**

25 - 29 Octobre 1999 - Richmond USA  
website : <http://www.vcu.edu/ISCANI/>

-----  
**EURO PM99**

3rd European Conference on Advances in Hard Materials Production  
8 - 10 Novembre 1999 - Turin - Italie  
Web site : <http://www.epma.cm>

-----  
**Sintering 2000**

NOUVEAU

7th International Conference on Sintering  
Sintering Science and Technology beyond 2000AD  
22 - 25 Février 2000 - New Delhi - Inde  
E\_Mail : gsu@iitk.ac.in

-----  
**JRFM'2000**

NOUVEAU

23 - 24 Mai 2000 - Bordeaux France  
Wbesite : <http://www.bls.fr/amatech>

-----  
**4th EUROMECH**

NOUVEAU

26 - 30 Juin 2000 - Metz - France  
E\_Mail : euromech@lpmm.univ-metz.fr  
WebSite : <http://www.lpmm.univ-metz.fr/euromech>

-----  
**III European Conference on Fluidization**

NOUVEAU

29 - 31 Mai 2000 - Toulouse - France  
E\_Mail : Progep@ensigct.fr

=====  
**Annonces de Soutenance de Thèses**  
=====

**Caractérisation et réactivité de la surface de poudres nanométriques d'oxydes métalliques: Analyse par spectrométrie IR-TF et application à l'étude des mécanismes de détection de gaz par capteurs résistifs.**

**Jérôme Tribout** - Université de Limoges, Limoges, France, 14 décembre 1998.  
Directrice: Marie-Isabelle Baraton

=====  
**Distinct Element Modelling of a Planetary Ball Mill**  
=====

**M.P. Dallimore** - Dpt of Mechanical and Materials Engineering - University Western Australia - Australie

**Synthèse et Propriétés de Ferrites Nanométriques : Influence de l'énergie de surface sur les propriétés structurales et magnétiques de ferrites de titane synthétisés par chimie douce et mécanosynthèse**

**N. Guigue - Millot** - 26 Novembre 1998 - LRRS UMR 5613 CNRS - Univ. Bourgogne - Dijon - France  
**Jury** : J. Etourneau, A. Rousset, G. Bertrand, D. Stuerger, G. Le Caër, M. Guyot, O. Isnard, P. Perriat

**Transformations antiferromag - ferromag - paramagnétiques - verre de spin dans les alliages de Fe Rh nanocristallisés par Broyage**

**E. Navarro** - Université de Complutense - Madrid - Espagne - 18 Mai 1998  
Co directeurs : A. Hernando - A.R. Yavari

**Modifications morphologiques et microstructurales du matériau actif des cathodes de batteries à l'ion lithium induites par broyage et traitement thermique**

**Ph. Perrot** - Université de Poitiers - 6 Mai 1998

**Co - Directeurs** : E.L. Mathe, M. Grosbras

**Jury** : J. Mimault, H. Van Damme, A. Dager, M. Broussely, P. Goudeau, E.L. Mathe, M. Grosbras

**Effects of the mechanical milling on carbons : negative electrode materials of Li - ion batteries"**

**F. Salver Disma** - Université de Picardie Jules Verne - 4 Février 98

**Jury** : Aymard L., Beguin F., Coulon M., Furdin G, Lassegues JC, Percheron Guegan A., Rouzaud JN, Tarascon JM.

**"Elaboration et Caractérisations de Cermets Alumine - Métal à partir de poudres obtenues par Mécanosynthèse"**

**J.-L. Guichard** - INPL - Nancy - 23 Janvier 1998

**Jury** : A. Simon, C. Carry, F. Thévenot, G. Le Caër, A. Mocellin

**"Spinelles nanométriques à valence mixte et à fort taux de lacunes cationiques : Transfert électroniques dans un ferrite de molybdène Fe<sub>2.47</sub>Mo<sub>0.53</sub>O<sub>4</sub>, de la synthèse aux propriétés magnétiques dans le système fer - vanadium Fe<sub>3-x</sub>V<sub>x</sub>O<sub>4</sub> (0<sup>2</sup>x<2).**

**V. Nivoix** - Université de Bourgogne - 17 Décembre 1997

**Jury** : M. Lenglet, H. Pascard, G. Bertrand, E. Gaffet, M. Guyot, M. Lallemand, A. Rousset, B. Gillot

**"The Preparation of Nitrides and Carbides by Mechanical Treatment - Phases and Structures"**

**G.M. Wang** - School of Physics, University College, The University of New South Wales - Australian Defence Force Academy - Canberra, ACT 2600 - Australia - 10/12/97

**Supervisor** - S.J. Campbell - **Co - Supervisors** : W.A. Kaczmarek and A. Calka

**"Suivi par Diffraction X en Temps Réel de la Formation par Combustion des intermétalliques des systèmes Al - Ni, Al - Ti, Al - Ni - Ti"**

**J. F. Javel** - Université de Nancy I - 3 Octobre 1997

**Jury** : J.F. Berar, F. Bernard, M. Bessiere, M. Dirand, J.C. Gachon, P. Galez, J.C. Jorda

**"Contribution à l'Etude de la Transformation - Tribologique Superficielle en Fretting"**

**E. Sauger** - Ecole Centrale de Lyon - Génie des Matériaux - 26 Septembre 1997

**Jury** : L. Mora - Ponsonnet, P. Blanchard, K. Dang Van, C. Esnouf, E. Gaffet, E. Rosset, A.B. Vannes, L. Vincent

=====  
**Sites internet à découvrir**  
=====

Site sur la cristallographie / Soft + Littérature

<http://www.lmcp.jussieu/sincris-top/logiciel>

N.B. : si vous connaissez d'autres sites en relation avec les thèmes développés par le RFM, faites nous les connaître

**Ph D Position  
and  
Post Doc Position  
Proposals**

**Denmark (22/02/99)**

One Ph.D. position will be available in the department of Physics at the Technical University of Denmark from 1st April 1999. The candidate will work in the area of Crystallization Kinetics in Bulk Metallic Glasses, which is associated with a Talent Project supported by the Danish Research Council. The position is for three years, and monthly salary is about 20,000 DKr (3300 USD). Applications including a CV, publication list, and names of three references should be sent as soon as possible to:

**NOUVEAU**

Assoc. Prof. Jianzhong Jiang  
Department of Physics, Building 307  
Technical University of Denmark  
DK-2800 Lyngby, Denmark  
e-mail [jiang@fysik.dtu.dk](mailto:jiang@fysik.dtu.dk)  
fax. +45 45 93 23 99  
tel +45 45 25 31 65

**Québec (CANADA) ( 22/01/99)**

Institut National de la Recherche Scientifique  
Département ...nergie et Matériaux

**POST-DOCTORAL POSITION IN Ni-MH BATTERY TECHNOLOGY**

Candidates will be interested in developing a research project focused on the study of new materials for use as negative electrode in nickel-metal hydride (Ni-MH) batteries. Mg-based compounds as electrode material and high-energy ball milling as synthesis method will be privileged. Particular efforts will be performed in order to clarify the correlation between the structure, the composition and the morphology of the alloy and its electrochemical performances.

Experience in electrochemistry and materials science is essential, a working knowledge of Ni-MH battery is an advantage.

Applicants must have obtained their Ph-D between July first, 1996 and January first, 2000.

The work will start between June 1st, 1999 and May 31, 2000.

Initial appointment is for one year, renewable for one year. Salary is \$28,000/year, which could be increased with qualifications and experience.

Applicants should send a CV including a list of publications before March 1st, 1999 to:

Pr. Lionel ROUE

INRS- Energie et Matériaux

1650, bd. Lionel Boulet

Varenes, Québec, CANADA

J3X 1S2

E-Mail: [HYPERLINKmailto:roue@inrs-ener.quebec.ca](mailto:HYPERLINKmailto:roue@inrs-ener.quebec.ca) / [roue@inrs-ener.quebec.ca](mailto:roue@inrs-ener.quebec.ca)•

**USA (17/12/98)**

Rutgers University is seeking a postdoctoral associate with demonstrated expertise in mechanochemistry to work on research focused on biomaterials. The candidate must be able to work on research focused on biomaterials. The candidate must be able to work as part of multidisciplinary team involving industry and academia focused on making biomedical implant devices. The candidate should demonstrate the ability to work independently, publish in archival journals and present their work in a public forum. The candidate should send a curriculum vitae, three representative publications (preferably with the candidate as a first author) and the names, address, email and phone numbers of three references that can comment on the candidate's capabilities. The position is available immediately at a salary of \$32,000 with health benefits included. The position will be posted until a suitable candidate is identified. Interested candidates should send correspondence to

Professor R.E. Riman

Rutgers University

Department of Ceramic and Materials Engineering

607 Taylor Road

Piscataway, NJ 08854 - 8065

[Riman@alumina.rutgers.edu](mailto:Riman@alumina.rutgers.edu)

**Brésil**

Post doc to work in electron microscopy characterization of nano - structured materials.

Contact : Walter J. Botta. F. - Federal University of Sao Carlos - Sao Paulo State - Brésil

Adresse : DEMA - UFSCar - CP 676, 13565 - 905 Sao Carlos SP Brésil.

tél : 016 - 2608251 - Fax : 016 2615404.

## **Belgique**

The Department Metallurgy and Materials Engineering (MTM) of the K.U.Leuven (Belgium) has a research position available. Candidates are asked to contact the responsible staff member.

Area of research :

Metals and Alloys, Polymer Matrix Composites, Intelligent Processing of Materials, Surface Engineering and Tribology, Metal Forming and Mechanical Behaviour of Materials, Quality Control and Non-Destructive Testing of Materials, Ceramics, Thermodynamics, Corrosion, Nuclear Engineering

Description of research task

Tailor made powders by mechanical alloying of Fe and Cu based materials. Application field: specific composite materials, to be prepared by conventional PM consolidation techniques. Research activities: parametric study of MA, alloy design, microscopic

Staff member to be contacted

Prof. Dr. Ir. L. Froyen

Katholieke Universiteit Leuven - Dept. MTM

de Croylaan 2 - B-3001 Leuven (Belgium)

Tel. +32/16/22.09.31

## **Japon**

Our group: Nanocomposite Group, Department of Composite Materials, National Institute of Materials and Chemical Research, Tsukuba, Ibaraki, Japan is now looking for post-doc researchers

The candidates would be integrated in the Nanocomposite Group of the Department of Composite Materials. The research interests of the group are mainly focused on nanocomposite preparation and its optical/chemical functionalities. Research projects currently under way aim to develop nanostructured and optically/chemically active thin films by sputtering, laser ablation and so on. For additional information about the Institute and group :

<http://www.nimc.go.jp/>

<http://www.aist.go.jp/NIMC/fcg/index.html>

Experience in the fields of materials science (ceramic or metal) is required.

There are two types of post-doc positions.

1. Long-term: from 6 months to 2 years

2. Short-term: from 1 to 3 months

If you or someone in your laboratory is interested in this fellowship, please contact as soon as possible to:

Dr. Naoto Koshizaki - Department of Composite Materials

National Institute of Materials and Chemical Research(NIMC) 1-1 Higashi, Tsukuba, Ibaraki 305-8565 JAPAN

Tel: +81-298-54-6335 - Fax: +81-298-54-6252 - E-mail: [koshizaki@nimc.go.jp](mailto:koshizaki@nimc.go.jp)

<http://www.aist.go.jp/NIMC/fcg/index.html>

## Bibliographie Récente

### Livres ou "Special Issues"

#### **Bulk Amorphous Alloys : Preparation and Fundamental Characteristics**

A. Inoue

Materials Science Foundation Vol. 4 - Trans Tech Publications : <http://www.ttp.net>

Interest in bulk amorphous alloys has increased rapidly throughout the world and these materials have now gained a position of great importance in basic science and engineering materials technology. Bulk amorphous alloys based upon the Zr - Al - Ni - Cu, Zr (Ti,Nb) - Al - Ni - Cu and Zr - Ti - Ni - Cu - Be systems have already achieved wide commercial success as components of various technical accessories ranging from sporting goods to optical instruments.

Here is a state of the art reviews on this new group of materials, covering all areas of interest, ranging from the synthesis of these special alloys and their fundamental properties, to their engineering characteristics and applications.

This work will therefore be of equal interest to those who wish to become fully acquainted with the subject, and to those who are already actively engaged in the field.

-----

#### **DISPERSION-STRENGTHENED ALUMINIUM PREPARED BY MECHANICAL ALLOYING**

Michal Besterci, Institute of Materials Research, Slovak Academy of Sciences, Kosice

In the book, the author describes the theoretical and technological fundamentals of mechanical alloying the Al-C system. Special attention is given to material characteristics, the kinetics and mechanism of mechanical alloying, methods of mixture compaction and heat treatment of compacted parts. Models of dispersoid spatial arrangement, dispersoid evaluation and optimisation and experimental possibilities are discussed. The interpretation of the static and dynamic mechanical properties, especially strength and ductility properties at 20 °C, mechanical properties at elevated temperatures are discussed, with emphasis on the effect of interface, superplasticity, creep and creep-fatigue characteristics. Content

Introduction

1. Characteristics of dispersion-strengthened systems 2. Mechanical alloying (kinetics and mechanism of preparation of the Al-C system by mechanical alloying; compaction of powders and heat treatment of compacts;

3. Microstructure and quantitative evaluation of parameters of dispersion-strengthened materials (definition and properties of interparticle distance; experimental possibilities of determination of structural objects; models of heterogeneous structures and their evaluation; simulation of model structures; analysis of the spatial distribution of particles in the Al-Al4C3 material) 4. Static and dynamic mechanical properties (mechanical properties at elevated temperatures;

mechanical properties at 20°C; effect of interface on the mechanical properties; superplastic properties of the system; thermal stability of the system; creep characteristics; creep-fatigue characteristics)

References

Index

ISBN 189832655X, 80 pages, 234×156 mm, soft laminated cover, £22.00, January 1999

Cambridge International Science Publishing 7 Meadow Walk, Great Abington, Cambridge CB1 6AZ, England Fax +44 1223 894539; Tel +44 1223 893295 Email: [cisp@cisp.demon.co.uk](mailto:cisp@cisp.demon.co.uk)

<http://www.demon.co.uk/cambsci/homepage.htm>

-----

#### **"Mechanical Alloying"**

Auteurs : Li Lü & Man On Lai (National University of Singapore)

Kluwer Academic Publishers

**Contents :** Preface - Introduction to Mechanical Alloying - Experimental Set - Up - The Mechanical Alloying Process - Formation of New Materials - Characterization of Powders - Densification - Mechanical Properties - Mechanisms of Mechanical Alloying - Modeling of Mechanical Alloying - Index

-----

#### **"Surface-Controlled Nanoscale Materials for High-Added-Value Applications"**

Editors: Kenneth E. Gonsalves, Marie-Isabelle Baraton, Rajiv Singh, Heinrich Hofmann, Jerry X. Chen, and Joseph A. Akkara.

Materials Research Society, Symposium Proceedings Volume 501, 1998

MRS, Warrendale, Pennsylvania, USA (website: <http://www.mrs.org/>)

-----

## "Nanomatériaux"

Auteurs : E. Gaffet, S. Begin - Colin, O. Tillement

Editeur : Innovation 128 - 24 Rue du Quatre Septembre - 75002 Paris - France

Les dernières années ont vu apparaître dans le monde des matériaux avancés le préfixe "nano" (nanostructuré, nanocristallins, nanophase ou nanométrique) ; les conférences et les forums sur Internet se multiplient où s'échangent des informations sur les avancées scientifiques et technologiques dans ce domaine des matériaux nanostructurés qui se distinguent des matériaux polycristallins conventionnels par la dimension des cristallites les composant ou par la dimension des hétérostructures présentes : ces dimensions sont de quelques dizaines d'angströms, voire de quelques nanomètres. A ces dimensions, les propriétés des matériaux changent radicalement.

Au début des années 90, les japonais ont été les premiers à lancé d'ambitieux programmes de R & D puisque le MITI a consacré aux nanomatériaux près de 200 millions de dollars pour la période 1990 - 2000 et que la Science & Technology Foundation a investi presque la même somme pour co - financer des projets de laboratoires publics et privés. Les Etats Unis puis les pays européens ont investi plus tardivement mais déjà ont obtenu des résultats prometteurs (.....) Certaines applications existent déjà au niveau international, quelque 400 sociétés se partagent aujourd'hui un marché voisin de 1 milliard de dollars mais qui devrait tripler, voire quintupler à l'horizon 2001.(.....)

(...) Pour aider les industriels concernés à imaginer les applications qu'ils pourraient s'approprier et identifier les acteurs internationaux, la présente étude dresse un état de l'art complet des nanomatériaux en décrivant leurs procédés d'élaboration actuels ou envisagés et en détaillant leurs différentes propriétés physico - chimiques et les géométries que l'on peut obtenir.

Enfin l'étude permet de cerner les applications actuelles et potentielles...

## CHEMISTRY FOR SUSTAINABLE DEVELOPMENT

Vol. 6, No. 2-3, MARCH-JUNE 1998

Proceedings of 2d International Conference on Mechanochemistry

(INCOME-2), which was held in Novosibirsk in 1997.

Contact : Prof. • N.Z. Lyakhov, Inst. Sol. State Chem.- Russian Acad Sci. - Kutaleladze, 18 - Novosibirsk - 630128 Russia - The Proceedings will be available by the price 80 USD.

## Mechanochemistry of Materials Cambridge International Science Publishing

Emmanuel Gutman - Materials Eng. Dpt - Ben Gurion University - Beer Sheva - Israel

Considerable advances have been made in mechanochemistry in the last couple of decades. Training of experts in this field with a background in materials science, chemical and mechanical engineering, etc. requires study of the fundamentals of mechanochemistry. There is a need for a textbook in the general and compressed form which would cover many aspects and would be used as a basis for understanding the fundamental principles to control mechanochemical phenomena. This textbook is based on lectures given by Prof. Gutman in a graduate course in the mechanochemistry of materials at the Ben - Gurion University of the Negev. The book contains examples of experimental results to illustrate the mechanochemical phenomena and technologies.

## BIBLIOGRAPHY ON MECHANICAL ALLOYING AND MILLING

Suryanarayana (Inst for Materials and Advanced Processes, University of Idaho, USA )

The present bibliography covers information on mechanical alloying and milling of materials starting from 1970 (when it was recognized that MA has become a commercial/viable material processing technique instead of just a grinding method) to 1996. All the available references will be presented in a chronological fashion. Under each year, (.....)

Please send your order to: Book Department - Cambridge International Science Publishing 7 Meadow Walk, Great Abington, Cambridge CB1 6AZ, England Fax: +44 1223 894 539; tel +44 1223 893295, email: orders@cisp.demon.co.uk / Cambridge International Science Publishing <http://www.demon.co.uk/cambsci/homepage.htm>

## Proceeding du Congrès "Mechanically Alloyed, Metastable and Nanocrystalline Materials"- Barcelone (1997)

Editor : M.D. Baro, S. Surinach - Materials Science Forum 269 - 272 (1998)

## PERIODIQUES

(Rubrique réalisée grâce aux moyens de la bibliothèque de  
l'Université de Technologie de Belfort - Montbéliard / UTBM)

### **[35] INTERACTION OF ALLOYS AND INTERMETALLIC COMPOUNDS OBTAINED BY MECHANOCHEMICAL METHODS WITH HYDROGEN**

IG Konstanchuk, E.Y. Ivanov, VV Boldyrev - Russian Chemical Reviews, 67 (1998) 69 - 79

Data on hydrogenation of mechanical alloys and intermetallic compounds formed in the course of mechanical alloying and mechanical milling are generalised. It is shown that mechanochemical methods make it possible to solve a number of problems arising in the hydrogenation of metals and alloys and to synthesise novel hydrides and nanocomposite materials. The mechanism of hydrogenation of mechanical alloys is discussed. The bibliography includes 98 references.

### **[34] MECHANICALLY ACTIVATED SYNTHESIS OF NANOCRYSTALLINE POWDERS OF FERROELECTRIC BISMUTH VANADATE**

Shantha K. Subbanna GN. Varma KBR.- Journal of Solid State Chemistry. 142(1):41-47, 1999

Mechanical milling of a stoichiometric mixture of Bi<sub>2</sub>O<sub>3</sub> and V<sub>2</sub>O<sub>5</sub> yielded nanosized powders of bismuth vanadate, Bi<sub>2</sub>VO<sub>5.5</sub> (BN). Structural evolution of the desired BiV phase, through an intermediate product (BiVO<sub>4</sub>), was monitored by subjecting the powders, ball milled for various durations to X-ray powder diffraction (XRD), differential thermal analysis (DTA), and transmission electron microscopic (TEM) studies. XRD studies indicate that the relative amount of the BiV phase present in the ball-milled mixture increases with increase in milling time and its formation reaches completion within 54 h of milling. Assynthesized powders were found to stabilize in the high-temperature tetragonal (gamma) phase. DTA analyses of the powders milled for various durations suggest that the BN phase-formation temperature decreases with increase in milling time. The nanometric size (30 nm) of the crystallites in the final product was confirmed by TEM and XRD studies. TEM studies clearly demonstrate the growth of BiV on Bi<sub>2</sub>O<sub>3</sub> crystallites.

### **[33] AB INITIO DETERMINATION OF THE NOVEL PEROVSKITE-RELATED STRUCTURE OF LA<sub>7</sub>MO<sub>7</sub>O<sub>30</sub> FROM POWDER DIFFRACTION**

Goutenoire F. Retoux R. Suard E. Lacorre P.- Journal of Solid State Chemistry. 142(1):228-235, 1999

A new mixed valence molybdate, La<sub>7</sub>Mo<sub>7</sub>O<sub>30</sub>, first prepared by high energy ball milling, has been successfully synthesized by controlled hydrogen reduction of La<sub>2</sub>Mo<sub>2</sub>O<sub>9</sub>. Its original crystal structure was determined from X-ray and neutron powder diffraction (space group R- $\bar{3}$ ); a = b = 17.0051(2) Angstrom, 6.8607(1) Angstrom; Z = 3;; reliability factors: R-p = 0.081, R-wp = 0.091,  $\chi^2$  = 3.1, R-Bragg = 0.049, R-F = 0.033). It consists in the hexagonal stacking of individual cylinders of perovskite-type arrangement. These cylinders are built up from perovskite cages sharing corners in trans-position along their diagonal axis. Two different mixed-valence molybdenum sites coexist, with more (Mo+5.75) Or less (Mo+4.5) distorted octahedral environments. Lanthanum atoms are located within the perovskite cages and around them, very close to their regular positions in the perovskite structure. Lanthanum and molybdenum atoms thus form two rows of almost perfect cubes, shifted from each other by c/2. An electron microscopy study revealed the defect-free cationic and octahedral arrangements in the (a,b) plane.

### **[32] THE FORMATION OF TI-POLYCIDAL GATE STRUCTURE WITH HIGH THERMAL STABILITY USING CHEMICAL-MECHANICAL POLISHING (CMP) PLANARIZATION TECHNOLOGY**

Kim HS. Ko DH. Bae DL. Fujihara K. Kang HK. - IEEE Electron Device Letters. 20(2):86-88, 1999

A planarized Ti-polycide gate structure with high thermal stability has been developed using a chemical-mechanical polishing (CMP) process for the application of high-speed DRAM devices. For a given gate length and without any thermal annealing, the planarized Ti-polycide structure developed via a novel gate line formation technology manifested a substantially lower gate line resistance than that produced by a conventional processing method. In addition, the agglomeration of the TiSi<sub>2</sub> gate in a deep submicron regime was suppressed even after high-temperature cycling at 850 degrees C for 300 min, owing to a negligible local stress at the corner of the active and field region.

### **[31] INFLUENCE OF KAOLINITE DELAMINATION ON RHEOLOGICAL PROPERTIES AND SEDIMENTATION BEHAVIOUR OF CERAMIC SUSPENSIONS**

Tari G. Fonseca AT. Ferreira JMF. - British Ceramic Transactions. 97(6):259-262, 1998

Ceramic suspensions were prepared by blending, in aqueous media, kaolinite and a very fine silica sand in various proportions, stirring, and ball milling. The influence of milling time on the state of aggregation of primary kaolinite particles was followed by rheological measurements, particle size analysis, and scanning electron microscopy (SEM). Steady shear measurements showed that the viscosity of ceramic suspensions strongly increased with increasing duration of milling, due to the gradual destruction of the face to face aggregates naturally occurring in clay minerals. The particle size distribution was narrowed and the mean particle size shifted to lower values. These modifications led to an increase in surface area and to more extensive face-edge type interactions among primary kaolinite particles, accentuating an observed shear thinning character of the suspensions. An optimum ceramic suspension preparation procedure, in which the minimum amount of plastic component required for effective suspension of the hard constituent of the mix composition, was determined by rheological measurements and sedimentation tests on experimental suspensions of varied composition. The minimum amount of plastic component represents a good compromise between the deleterious effect of clay delamination on suspension viscosity and its beneficial effect during discharge after milling. BCT/323.

### **[30] GRAIN-GROWTH KINETICS IN NANOCRYSTALLINE IRON PREPARED BY BALL MILLING**

A Michels, CE Krill, H Natter, R Birringer - GRAIN GROWTH IN POLYCRYSTALLINE MATERIALS III, 1998, pp 449-454 - 3RD INTERNATIONAL CONFERENCE ON GRAIN GROWTH (ICGG-3); PITTSBURGH,

PENNSYLVANIA. JUNE 14-19, 1998

We have prepared nanocrystalline Fe by ball milling and investigated the kinetics of grain growth at annealing temperatures between 325 degrees C and 535 degrees C. Three different grain-growth models were used to describe the size-evolution curves: a generalized Hillert growth law with variable exponent (used to describe normal grain growth in the absence of impurities), the Burke equation assuming a constant retarding force on moving grain boundaries, and a third model in which the retarding force scales with the mean grain size owing to impurity enrichment in the grain boundaries. Based on the generalized Hillert analysis, a previous investigation of grain growth in ball-milled nanocrystalline Fe yielded a temperature-dependent growth exponent that approached the expected value of 0.5 only at high temperatures. In contrast, we find that the grain-growth kinetics in our ball-milled Fe samples are better described by either of the two models accounting for the influence of impurities on the growth rate. Since both models reduce to the ideal Hillert model for negligible impurity concentrations, their underlying growth exponent is 0.5. This suggests that the temperature dependence of the exponent reported for ball-milled Fe is an artefact of the model used to interpret the grain-growth data.

**[29] NANOGRAIN REFINEMENT AND GROWTH DURING MECHANICAL ATTRITION IN IRON**

HH Tian, M Atzmon - GRAIN GROWTH IN POLYCRYSTALLINE MATERIALS III, 1998, pp 479-484 - 3RD INTERNATIONAL CONFERENCE ON GRAIN GROWTH (ICGG-3); PITTSBURGH, PENNSYLVANIA. JUNE 14-19, 1998

The grain-size evolution in Fe powder during ball milling has been investigated by x-ray diffraction and Fourier analysis. Steady-state grain sizes below 10 nm are obtained, which increase weakly with increasing milling temperature. A phenomenological model is proposed, based on the assumption of simultaneous grain refinement and grain growth. The observed weak temperature dependence of the steady-state grain size is consistent with non-equilibrium vacancy production.

**[28] GRAIN GROWTH IN TITANIUM-ALUMINIDE-BASED ALLOYS WITH NANOCRYSTALLINE AND MICROCRYSTALLINE STRUCTURES**

ON Senkov, FH Froes, N Srisukhumbowornchai, ML Ovecoglu - GRAIN GROWTH IN POLYCRYSTALLINE MATERIALS III, 1998, pp 701-706 - 3RD INTERNATIONAL CONFERENCE ON GRAIN GROWTH (ICGG-3); PITTSBURGH, PENNSYLVANIA. JUNE 14-19, 1998

Results are presented on grain growth studies of the gamma titanium aluminide Ti-47Al-3Cr and Ti-48Al-2Nb-2Cr (at. %) alloys with nanocrystalline (initial grain size  $D_0 < 100$  nm) and microcrystalline ( $D_0$  similar to 1  $\mu$ m) structures. The alloys were produced by a hot isostatic pressing from gas-atomized and mechanically alloyed powders. The grain size distribution and mean grain size were determined after annealing at temperatures in the range of 725 degrees C to 1200 degrees C for annealing times of up to 800 hours using TEM. Grain size distributions normalized to the mean grain size were single-modal and time- and temperature- invariant both in the case of nano- and micro-crystalline materials. The grain growth was described by a single thermally activated rate process limited by a permanent pinning force.

**[27] RESEARCH ON THE VARIABLE MASS PARAMETER COLLISION IN VIBRATION MILL**

SL Wang, JG Li, QZ Gao, YP Hu - ICVE'98: PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON VIBRATION ENGINEERING, VOL I, 1998, pp 166-167 - INTERNATIONAL CONFERENCE ON VIBRATION ENGINEERING (ICVE 98); DALIAN, PEOPLES R CHINA. AUGUST 6-9, 1998

Collision is the most important performance in vibration mill. It's illustrated in this paper that the collision mass of the grinding media in the machine is not a constant but a variable during the exciting period, its principal frequency is equal to that of the input. Under certain conditions the collision mass alternates between positive and negative. Also its amplitude changes slowly with time and has a period about 3 times that of the driving force in this study.

**[26] STRUCTURAL CHANGES OF MULLITE PRECURSORS IN PRESENCE OF POLYETHYLENEIMINE**

Tkalcic E. Hoebbel D. Nass R. Schmidt H. - Journal of Non-Crystalline Solids. 243(2-3):233-243, 1999

Thermal properties of two powders derived from the same calcined gel with a stoichiometric mullite composition (atomic ratio Al/Si = 3/1) wet milled in different solutions were studied by simultaneous differential thermal analysis, thermogravimetry and evolved gas analysis (DTA, TG, EGA, respectively), by density measurements and by Si-29 MAS NMR spectroscopy and X-ray diffraction (XRD). Calcined gel was milled either in ethanol or in ethanol with the addition of 0.03 g of polyethyleneimine (PEI) per gram of mullite. DTA, TG and mass spectrometry revealed esterification of unhydrated surface of particles formed by milling in ethanol. The difference in the structural evolution of powders and their dependence on annealing temperature seen in Si-29 MAS NMR spectra and XRD patterns is attributed to different degrees of segregation of alumina and silica components, and to differing compositions of transitory spinel phase. In both samples the segregation of silica and alumina was observed at temperatures less than that for mullite crystallization. The degree of segregation was much smaller in the sample milled in ethanol. Therefore, in the latter sample spinel with larger silica content incorporated in gamma-Al<sub>2</sub>O<sub>3</sub> will crystallize by annealing at 900 degrees C, and Al-rich mullite at 1100 degrees C. Due to greater segregation of silica and alumina component in the presence of PEI, the crystallization of spinel with smaller amounts of silica incorporated into gamma-Al<sub>2</sub>O<sub>3</sub> is shifted to 1100 degrees C, and orthorhombic mullite to about 1200 degrees C. The influence of PEI is indicated by a larger sintering density at lower temperatures.

**[25] MAGNETIC DISORDER IN THE CU<sub>0.995</sub>FE<sub>0.005</sub>O SOLID SOLUTION**

Stewart SJ. Borzi RA. Mercader RC. - Journal of Magnetism & Magnetic Materials. 192(1):77-82, 1999

The magnetic hyperfine field, measured by Mossbauer spectroscopy, of a Cu(Fe)O solid solution displays a spin-glass-like behaviour that undergoes two transitions. The samples were produced by a 48 h ball-milling and 40 h successive annealing treatments at 650, 700 and 800 K with 0.25 mol% of alpha-(Fe<sub>2</sub>O<sub>3</sub>)-Fe-57 and CuO. The signal shows a magnetic splitting that develops at temperatures lower than ca. 150 K. The measured distribution of hyperfine fields broadens at lower temperatures and its behaviour down to 15 K extrapolates to a saturation field of approximate to 29 T. The second transition takes place at temperatures between 4.2 and 15 K. The observed

magnetic behaviour is interpreted in terms of magnetic disorder and canted local states of the system of magnetic moments.

**[24] STRUCTURE AND PROPERTIES OF MECHANICALLY ALLOYED STEEL PK50N2M**

Antsiferov VN. Bobrova SN. Shatsov AA. - Powder Metallurgy & Metal Ceramics. 37(3-4):153-157, 1998

The possibility of improving the properties of powder metallurgy nickel-molybdenum steel PK50N2M by dispersing and homogenizing the initial powders via grinding in a high-energy planetary mill, followed by single pressing and sintering, and subsequent quenching and tempering, was investigated. It was established that structural heredity provided small pore size, high homogeneity, a favorable defect density and distribution, an optimal phase composition in the heat-treated steel, and a transformation under load. These features permitted the attainment of a high level of mechanical properties, even at relatively high porosities.

**[23] PARTICLE SIZE EVOLUTION IN CU-15AT% AL MECHANICALLY ALLOYED**

Guerrero-Paz J. Jaramillo-Vigueras D. - Nanostructured Materials. 10(7):1209-1222, 1998

Characterization of the particle size in a Cu-15at%Al powder mixture, processed in a low energy mill, was conducted. Milling times included 1.8, 7.2, 28.8, 54, 90, 180, 360, and 864 Ks. A commercial particle size analyzer, based on the sedimentation-photometry technique, was used to obtain particle size distributions according to frequency of number, volume, or area. Equivalent medium diameter for particles as a function of milling time is reported. These results are supported by observations in optical, scanning and transmission electron microscopes. A high number of submicrometric fragments were detected since the early milling times (1.8 Ks up to 180 Ks). This observation could have relevance for the study of the mechanisms of the mechanical alloying and of the nanometric grain size formation. A competition between fragmentation and coalescence events in the particle population has been observed to take place during the complete milling process.

**[22] A NEW MECHANOCHEMICAL REACTION OF THIOLS WITH IRON METAL**

Pavelko GF. - Russian Chemical Bulletin. 47(11):2316-2317, 1998

**[21] CORRELATION OF AMORPHIZATION EFFECTS IN TITANIUM SOLID SOLUTIONS VIA MECHANICAL MILLING AND ANNEALING**

Li DJ. Doherty KJ. Poon SJ. Shiflet GJ. - Philosophical Magazine A-Physics of Condensed Matter Defects & Mechanical Properties. 79(1):97-106, 1999

Powders of titanium solid solutions were amorphized completely via mechanical milling. Bulk samples of bcc titanium solid solution were also partially amorphized through low-temperature annealing. The reference alloy Ti65Cr13Cu16Mn4Fe2 requires the shortest milling time to achieve complete amorphization. A strong dependence of critical milling time for complete amorphization on alloy composition is found near the reference alloy. Meanwhile, the reference alloy is also the easiest to amorphize partially by annealing. The strong correlation of amorphization effects observed is consistent with the mechanism where the formation of amorphous areas is dependent on the size of the free-energy gap  $\Delta G(c \rightarrow a)$  between the crystalline phase and the amorphous phase and on how easily this gap can be closed. The smaller the free-energy gap  $\Delta G(c \rightarrow a)$  of the solid solution, the less milling is required for complete amorphization, and the more favourable amorphization by annealing becomes.

**[20] CONVERSION OF PROPANE INTO BUTANES CATALYZED BY SULFATED ZIRCONIA MIXED WITH PT/ZRO2**

Hino M. Arata K. - Chemical Communications. (1):53-54, 1999

An active catalyst for the conversion of propane into butanes is obtained by mechanically mixing sulfated ZrO<sub>2</sub> and Pt/ZrO<sub>2</sub>.

**[19] MICROSTRUCTURAL EVOLUTION OF FE SINTERED WITH AMORPHOUS FE75SI10B15 ADDITIVE**

Echude-Silva JH. Martinelli AE. de Lima SJG. Ambrozio F. Klein AN. - Powder Metallurgy. 41(4):255-259, 1998.

The addition of amorphous Fe-Si-B particles to Fe powder increases the shrinkage of sintered components resulting in higher densification rates. Consequently, several research groups worldwide have studied the properties of such systems in an attempt to produce superior structural alloys. In the present work, Fe75Si10B15 ribbons obtained by melt spinning were milled in a high energy Spex mill for times varying from 2 to 32 h. The resulting powders were characterised by differential thermal analysis and X-ray diffraction. The results showed that the amorphous characteristics of the ribbons persisted after the milling process. Next, samples consisting of a mixture of Fe powder and 4 wt-% milled amorphous phase were uniaxially pressed and sintered following a series of thermal cycles. High temperature microstructures were obtained for compacts subjected to rapid cooling from the sintering temperature. The results of scanning electron microscopy and energy dispersive spectroscopy revealed substantial precipitation of fine Fe<sub>2</sub>B particles before  $\alpha \rightarrow \gamma$  allotropic transformation. In addition, an oxide phase was observed in the interface between Fe and the additive particles. Preliminary analysis suggested that the oxide particles can be easily reduced by adding small amounts of carbon to the system.

**[18] MECHANOCHEMICAL SYNTHESIS OF NANOCRYSTALLINE TUNGSTEN CARBIDE POWDERS**

Tan GL. Wu XJ. - Powder Metallurgy. 41(4):300-302, 1998

Nanocrystalline tungsten carbide powder mixtures of WC, W<sub>2</sub>C, and cubic WC<sub>1-z</sub> were prepared by the mechanochemical method of reactive high energy ball milling WO<sub>3</sub>-Mg mixtures containing graphite as a source of carbon for the W phase. The synthesis is completed in two steps, namely the explosive reactive synthesis of  $\alpha$ -W by the reductive reaction of Mg with WO<sub>3</sub> and the diffusion reaction of high activity  $\alpha$ -W with C. The chemical regularities of mechanochemical synthesis of the refractory compounds are given. After grinding for 50 h at a milling rate of 250 rev min<sup>-1</sup>, all WO<sub>3</sub> and C diffraction peaks disappeared and only diffraction peaks of tungsten carbides and MgO remained. The final product, with an average grain size of about 4-20 nm was obtained after MgO was removed by HCl solution.

**[17] LOW-TEMPERATURE SYNTHESIS OF BAAL2O4 ALUMINUM-BEARING COMPOSITES BY THE**

#### **OXIDATION OF SOLID METAL-BEARING PRECURSORS**

Citak R. Rogers KA. Sandhage KH. - Journal of the American Ceramic Society. 82(1):237-240, 1999  
BaAl<sub>2</sub>O<sub>4</sub>/aluminum-bearing composites have been synthesized via the low-temperature oxidation of Ba-Al precursors. Ba-Al powder mixtures that were prepared via high-energy vibratory milling were uniaxially pressed into bar-shaped specimens that were then exposed to a series of heat treatments in pure, flowing oxygen at temperatures up to 640 degrees C. Oxidation at a temperature of 300 degrees C resulted in the formation of barium peroxide (BaO<sub>2</sub>). Additional heat treatment at a temperature of 550 degrees C resulted in the consumption of BaO<sub>2</sub> and some aluminum to yield BaAl<sub>2</sub>O<sub>4</sub> and Al<sub>4</sub>Ba. The oxidation of Al<sub>4</sub>Ba at a temperature of 640 degrees C yielded additional BaAl<sub>2</sub>O<sub>4</sub>. Microstructural analyses revealed that a well-dispersed, co-continuous mixture of Al<sub>2</sub>O<sub>3</sub>-excess BaAl<sub>2</sub>O<sub>4</sub> and 99.5% pure aluminum was produced.

#### **[16] NEAR-NET-SHAPED (BA,Sr)AL<sub>2</sub>Si<sub>2</sub>O<sub>8</sub> BODIES BY THE OXIDATION OF MACHINABLE METAL-BEARING PRECURSORS**

Viers DS. Sandhage KH. - Journal of the American Ceramic Society. 82(1):249-252, 1999  
A novel process has been used to fabricate refractory aluminosilicate bodies of near net shape: the oxidation of machinable, alkaline-earth-metal-bearing precursors. Ba-Sr-Al-Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> precursors of similar molar volume as strontium-doped celsian, (Ba,Sr)Al<sub>2</sub>Si<sub>2</sub>O<sub>8</sub>, were prepared by powder metallurgical processing. Precursor powder mixtures, obtained by high-energy vibratory ball milling, were compacted and formed into bars or disks by uniaxial pressing. The bar-shaped precursors were machined on a metal-working lathe using hardened steel tooling. The shaped precursors were oxidized and converted into celsian. The resulting celsian bodies retained the shapes, and fine machined features, of the precursors. The measured changes in dimensions were small and in good agreement with calculated values.

#### **[15] PREPARATION OF Mg<sub>2</sub>Co ALLOY BY MECHANICAL ALLOYING. EFFECTS OF THE SYNTHESIS CONDITIONS ON THE HYDROGENATION CHARACTERISTICS**

Bobet JL. Pechev S. Chevalier B. Darriet B. - Journal of Materials Chemistry. 9(1):315-318, 1999  
The influence of the synthesis route of Mg<sub>2</sub>Co hydrogen-storage alloy has been studied. It is shown here that mechanical alloying (MA) allows one to obtain crystallized products after milling for 100 h. It seems to crystallize in a face centered cubic structure (a = 1.153 nm). However, when the milling is continued beyond 100 h the amorphisation of Mg<sub>2</sub>Co is observed. After 210 h of milling Mg<sub>2</sub>Co is obtained with a yield of about 80%. Furthermore, when the product is annealed, the face centered cubic structure is maintained but the intensity ratio of the diffraction peak is changed markedly. When the milling time increase, the grain and crystallite size decrease so that the rate of the hydration increases. However, at the same time, a passivation mechanism should occur so that the maximum hydrogen storage capacity decreases.

#### **[14] APPLICATION OF MECHANOCHEMICAL TREATMENT TO THE SYNTHESIS OF A- AND G-FORMS OF LA<sub>2</sub>Si<sub>2</sub>O<sub>7</sub>**

Tzvetkov G. Minkova N. - Solid State Ionics. 116(3-4):241-248, 1999  
The impact of mechanochemical treatment on a mixture of La<sub>2</sub>O<sub>3</sub> and silica gel (in molar ratio La<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub> = 1:2) was examined by X-ray powder diffractometry, infrared spectroscopy and thermal analysis. Unlike pure La<sub>2</sub>O<sub>3</sub>, complete amorphization of the mixture takes place after 3-h milling. A lanthanum orthosilicate is formed in an amorphous state as a precursor of La<sub>2</sub>Si<sub>2</sub>O<sub>7</sub>. Subsequent thermal treatment of the milled samples leads to the crystallization of pure A- or G-La<sub>2</sub>Si<sub>2</sub>O<sub>7</sub>, depending on the temperature.

#### **[13] STRUCTURE CHANGE IN Fe<sub>4</sub>N POWDERS BY MECHANICAL MILLING: A NEW ASPECT AND CORRECTION OF OUR PREVIOUS REPORTS**

Sumiyama K. Onodera H. Suzuki K. Ono S. Kim KJ. Gemma K. Nishi Y. - Journal of Alloys & Compounds. 282(1-2):158-163, 1999  
We have prepared impurity-free Fe<sub>x</sub>N powders (x=3.6) and re-examined their structure change by mechanical milling and subsequent annealing. X-ray diffraction and Mossbauer spectroscopic studies of the milled powders indicate that the initial fee (gamma'-) Fe<sub>4</sub>N phase is mechanically deformed and changes to the hcp (epsilon-Fe<sub>3</sub>N type) phase, even though the Fe content is much higher than the stoichiometry of the latter compound. This phase transformation is due to the local structure similarity of Fe atoms in gamma'-Fe<sub>4</sub> and epsilon-Fe<sub>3</sub>N, and introduction of hcp type stacking faults along the most dense crystalline plane of (111) in the fee lattice by shear force. The epsilon-Fe<sub>3</sub>N phase is maintained after annealing at 230 degrees C and it almost returns to the gamma'-Fe<sub>4</sub>N phase after annealing at 420 degrees C. These results indicate that our previous reports for Fe<sub>x</sub>N powders (x greater than or equal to 4) are not correct: the gamma'-Fe<sub>4</sub>N phase does not martensitically transform to the bct (alpha'-) Fe-N phase by mechanical milling and the milled Fe<sub>x</sub>N powders do not become alpha''-Fe<sub>16</sub>N<sub>2</sub> by subsequent annealing. The previous results were confused by the coexistence of bcc (alpha)-Fe, the oxidation in the powder specimens, and the very broad structure-less X-ray diffraction patterns of the powder specimens milled for less than 300 h.

#### **[12] THE PRODUCTION OF A ND<sub>16</sub>FE<sub>76</sub>B<sub>8</sub> SINTERED MAGNET BY THE HYDROGEN DECREPITATION/HYDROGEN VIBRATION MILLING ROUTE**

Kianvash A. Harris IR. - Journal of Alloys & Compounds. 282(1-2):213-219, 1999  
The present work has been undertaken to investigate the potential of hydrogen vibration milling (HVM) as a possible replacement for roller milling (RM). The aim was to develop a more rapid laboratory method for producing a fine clean powder, suitable for the production of Nd-Fe-B sintered magnets. HVM has been applied to a Nd<sub>16</sub>Fe<sub>76</sub>B<sub>8</sub>-type alloy, using the highest possible amplitude (A) and frequency (nu) within the capacity of the present hydrogen vibration mill (HV mill). Under these conditions, the correlations between the amount of the material being milled at each stage, milling time, average particle size, and the magnetic properties of the sintered magnets made from these powders, have been investigated. The average powder particle sizes achieved in the HVM technique, for a batch of 50 g milled for 4 h, or for a batch of 300 g milled for 10 h, was well below 5 mu m This was lower than those of the powders produced by the RM or jet milling (JM) processes. Thus, intrinsic coercivities (H-ci) of up to 654 kA m(-1)

(8.2 kOe) with corresponding energy products [(BH)(max)] of up to 331 kJ m<sup>-3</sup> (41.5 MGOe) were obtained for the sintered magnets made from the HV milled powder. These values were significantly higher than those attained for the sintered magnets made by the hydrogen decrepitation (HD)/RM and HD/JM processes. As with conventional processing, applying an annealing treatment at 600 degrees C for 1 h followed by air cooling in vacuum increased further the H-ci and (BH)(max) values. The improvements in the magnetic properties of the HD/HVM magnets have been related to (a) the finer powder particles, (b) in-situ KD of the alloy, (c) the dry milling condition, and (d) the shielding nature of the hydrogen. Factors (b)-(d) should result in less oxygen pickup during milling.

**[11] DEHYDRIDING KINETICS OF A MECHANICALLY ALLOYED MIXTURE MG-10WT.%NI**

Song MY. Manaud JP. Darriet B. - Journal of Alloys & Compounds. 282(1-2):243-247, 1999

The rate-controlling steps for the dehydriding reaction of a mechanically alloyed mixture Mg-10wt.%Ni were determined by comparing empirical results with theoretical rate equations established earlier. For its dehydriding reaction at 575-615 K and 0.52-2.6 bar H<sub>2</sub>, the rate-controlling steps are considered the nucleation of alpha-solid solution of hydrogen in the range 0<H(d)less than or equal to 0.5, and both the bulk and Knudsen flow in the ranges higher than 0.5<H(d)less than or equal to 1.0 (mainly by Knudsen flow in the higher reacted ranges).

**[10] MICROSTRUCTURE DEPENDENCE OF THE MAGNETIC PROPERTIES OF NANOCOMPOSED MAGNETS**

Szlaferek A. - Journal of Alloys & Compounds. 282(1-2):248-251, 1999

The grain size effect on the magnetic properties of nanocrystalline, two-phase Nd<sub>2</sub>Fe<sub>14</sub>B/Fe<sub>3</sub>B powder mixtures has been studied. Each of the two phases was prepared by mechanical alloying and heat treatment. The remanence increases and the coercive field decreases with increasing weight fraction of the soft magnetic phase. The coercivity decreases and remanence increases with increasing grain size of the soft magnetic phase. The results provide arguments that the concentration and grain size of the soft magnetic phase plays a decisive role in the magnetic properties of nanocomposite magnets.

**[9] FORMATION OF GAMMA-CU67AL33 ALLOY BY MECHANICAL ALLOYING**

de Lima JC. Triches DM. dos Santos VHF. Grandi TA. - Journal of Alloys & Compounds. 282(1-2):258-260, 1999

In this paper, we show the results for nanostructured gamma-Cu<sub>67</sub>Al<sub>33</sub> alloy obtained by alloying mechanically elemental Cu and Al powders at room temperature. The severe plastic deformations produced by milling together with local temperature were not enough to promote successfully the solid state reaction. It causes a slowdown in reaction kinetics that yielded a poor crystallinity alloy showing a symmetry associated with space group I-43M. To reach the expected symmetry, space group P-43M, annealing at an appropriate temperature was performed. In addition, the crystallinity was improved and structural relaxation promoted. The adequate temperature as well as enthalpy associated with the space group change were determined by DSC measurements.

**[8] HYDROGEN STORAGE PROPERTIES OF NANOCRYSTALLINE MG1.9TI0.1NI MADE BY MECHANICAL ALLOYING**

Liang G. Huot J. Boily S. Van Neste A. Schulz R. - Journal of Alloys & Compounds. 282(1-2):286-290, 1999

The mechanical alloying technique was used to make nanocrystalline Mg<sub>2</sub>Ni and Mg<sub>1.9</sub>Ti<sub>0.1</sub>Ni powders. Their hydrogen storage properties were characterized and compared with that of polycrystalline Mg<sub>2</sub>Ni made by casting. It was found that the ball milled Mg<sub>2</sub>Ni and Mg<sub>1.9</sub>Ti<sub>0.1</sub>Ni can absorb hydrogen at 473 K in the first cycle rapidly without prior activation. The nanocrystalline Mg<sub>1.9</sub>Ti<sub>0.1</sub>Ni showed the best kinetics, followed in order by mechanically alloyed Mg<sub>2</sub>Ni and cast Mg<sub>2</sub>Ni. Mg<sub>1.9</sub>Ti<sub>0.1</sub>Ni absorbs more than 3 wt% H<sub>2</sub> in 2000 s at 423 K while the mechanically alloyed and the cast Mg<sub>2</sub>Ni do not form hydride at this temperature. Partial substitution of Mg by Ti reduced the activation energy of desorption from 69 kJ mol<sup>-1</sup> for nanocrystalline Mg<sub>2</sub>Ni to 59 kJ mol<sup>-1</sup> for Mg<sub>1.9</sub>Ti<sub>0.1</sub>Ni.

**[7] MECHANICAL ALLOYING OF CEFE4SB12 AND SUBSTITUTED COMPOUNDS CEFE3.5NI0.5SB12 AND CEFE4SB11TE. [FRENCH]**

Chapon L. Ravot D. Tedenac JC. - Comptes Rendus de l'Academie des Sciences Serie II Fascicule C-Chimie. 1(12):761-763, 1998

Mechanical alloying allows to synthesize nanocrystalline powder. In the case of thermoelectric compounds, the very small grain size can enhance the figure of merit by decreasing the thermal lattice conductivity. In this note, we present some preliminary results which we have obtained by applying this technique to CeFe<sub>4</sub>Sb<sub>12</sub>, a skutterudite compound with very promising thermoelectric properties, and the two substituted compounds CeFe<sub>3.5</sub>Ni<sub>0.5</sub>Sb<sub>12</sub> and CeFe<sub>4</sub>Sb<sub>11</sub>Te.

**[6] SYNTHESIS OF BORON NITRIDE NANOTUBES AT LOW TEMPERATURES USING REACTIVE BALL MILLING**

Chen Y. Gerald JF. Williams JS. Bulcock S. - Chemical Physics Letters. 299(3-4):260-264, 1999

Boron nitride (BN) nanotubes have been produced by thermal annealing at 1000 degrees C of elemental boron powders which were previously ball milled in ammonia gas for 150 h at room temperature. High-energy ball milling induces nitrating reactions between the boron powder and the ammonia gas. A metastable material is formed consisting of disordered BN and nanocrystalline boron. BN nanotubes then grow out from this metastable and chemically activated structure during heat treatment in the presence of nitrogen gas. This novel process for forming BN nanotubes is distinctly different from arc discharge and laser-heating processes.

**[5] PROPERTIES OF THE NANOCRYSTALLINE FINEMET ALLOYS PREPARED BY MECHANOCHEMICAL WAY**

Petrovic P. Brovko I. Sepelak V. Stevulova N. Hreha S. - Acta Physica Slovaca. 48(6):703-706, 1998

Mechanical alloying of pure elements and mechanical milling of crystal compounds are useful tools for preparing the Fe<sub>73.5</sub>Cu<sub>1</sub>Nb<sub>3</sub>Si<sub>13.5</sub>B<sub>9</sub> powder alloy with well-defined crystallite size as a function of milling time. This method avoids rapid quenching technology and is suitable for further pressing the powder with the aim to produce a bulk Finemet material. The kinetics of this process is discussed using the X-ray diffraction and Mossbauer spectroscopy results.

**[4] NANOCRYSTALLINE SM-FE-N POWDERS PRODUCED BY VARIOUS PROCESSES**

Jakubowicz J. Jurczyk M. - Acta Physica Slovaca. 48(6):751-754, 1998

The magnetic properties of high-energy ball-milled (HEBM), HDDR (hydrogenation, disproportionation, desorption, recombination) processed Sm<sub>2</sub>Fe<sub>17</sub>-type powders and their nitrides have been investigated. Sm<sub>2</sub>Fe<sub>17</sub>-carbonitrides were also synthesized by mechanochemical reaction between Sm<sub>2</sub>Fe<sub>17</sub> and pyrazine (C<sub>4</sub>H<sub>4</sub>N<sub>2</sub>).

**[3] SOME RECENT DEVELOPMENTS IN MECHANICAL ACTIVATION AND MECHANOSYNTHESIS**

E. Gaffet, F. Bernard, J.-C. Niepce, F. Charlot, Ch. Gras, G. Le Caër, J.-L. Guichard, P. Delcroix, A. Mocellin, O. Tillement - J. Mater. Chem., 9 (1999) 305 - 314

After outlining the general characteristics of high energy ball - milling, mechanochemical synthesis is argued to be an attractive method for the synthesis and transformations of materials. Phase transformations induced by milling, annealing of mechanically activated iron silicides, mechanically activated self - heat sustaining reactions (MASHS), for instance of FeAl, are first discussed. The route, which starts from mechanothesized powders to reach consolidated alumina - (Fe, Ti) composites, yields materials whose original morphologies and some mechanical properties are then described.

**[2] ELECTROCHEMICAL PROPERTIES OF AB<sub>5</sub>-TYPE HYDRIDE-FORMING COMPOUNDS PREPARED BY MECHANICAL ALLOYING**

Lenain, Aymard, Salver-Disma, Leriche, Chabre, Tarascon, Solid State Ionics 104 (1997) 237-248

Two types of intermetallic compounds, LaNi<sub>4</sub>M (M = Mn, Co, Cu and Al) and polysubstituted alloys Mm(NiAlMnCo)<sub>5</sub> (Mm = mischmetal) were synthesized by mechanical alloying. In most cases, 10 hours grinding were sufficient to obtain single phase alloys with crystallites of about 6 nm and particles ranging between 5 and 80 nm in diameter. The polysubstituted MmNi<sub>3,6</sub>Al<sub>0,35</sub>Mn<sub>0,25</sub>Co<sub>0,8</sub> alloys, once removed from the grinding container, were found to present an electrochemical capacity of 159 mAh/g. Such a capacity was increased to 216,3 mAh/g, 241,7 mAh/g and 273,5 mAh/g by a post-anneal step under vacuum to temperatures of 673, 873 and 1073 K, respectively. The various electrochemical capacity depends on both surface states and internal strains in the sample so that the heat treatments release these strains and enhance the capacity.

**[1] ELECTROCHEMICAL PROPERTIES OF MG<sub>2</sub>NI AND MG<sub>2</sub>NI<sub>2</sub> PREPARED BY MECHANICAL ALLOYING**

Lenain, Aymard, Tarascon - Journal Solid State Electrochemistry (1998) 22: 285-290

Crystallized Mg<sub>2</sub>Ni and Mg<sub>2</sub>Ni<sub>2</sub> amorphous alloys synthesized by mechanical alloying at room temperature were found to present first discharge capacities of 270 mAh/g and 500 mAh/g respectively. These capacities decrease upon subsequent cycling to reach 30 mAh/g and 70 mAh/g after 60 charge/discharge cycles. The largest initial capacity measured for the Mg<sub>2</sub>Ni<sub>2</sub> composition is ascribed to its amorphous nature, while its slowest capacity decay upon cycling to a fine Ni dispersion within the Mg-Ni matrix. This dispersion enables a better protection of the Mg against oxidation during cycling. We show, however, that this protection of Mg by Ni is not sufficient to avoid a strong corrosion of Mg in the KOH electrolyte during cycling leading to the formation of Mg(OH)<sub>2</sub>.

## Correspondants du Réseau Français de Mécanosynthèse 139 Laboratoires ou Groupes de Recherche

Bureau : E. Gaffet (Président), G. Le Caër (Secrétaire Général), A.R. Yavari (Trésorier)

### Allemagne

- K.U. Kainer

**Institut für Werkstoffkunde und Werkstofftechnik** " Light Metals, Powder Metallurgy and Composites Group - Agricolastr. 6 - D 38678 - Clausthal Zellerfeld - Allemagne

- P. Reynders
- A Sagel

**Merck - Pigments Division** ) Bldg M18 - 64271 Darmstadt - Allemagne

- M. Veith

**Institut für Metallphysik und Technologie** - Technische Universität Berlin - Hardenbergstr. 36 - PN 2 - 3 - D - 10623 - Berlin - Allemagne

**Universität des Saarlandes**, Institut für Anorganische Chemie - Postfach 15 11 50 - D 66041 - Saarbrücken - Allemagne

### Angleterre

- B. Cantor
- B. Mohamed
- P.Schumacher
- P. Shashi

**University of Oxford** - Dpt of Materials - Parks Rd - Oxford OXI 3PH - UK

Queen Mary & Westfield College - University of London - London - UK

**University of Oxford** - Dpt of Materials - Parks Rd - Oxford OXI 3PH - UK

**De Montfort University** - Emerging Technologies Research Centre - SER Centre - Howthron Building - Gateway - Leicester LE1 9BH - Royaume Uni

### Argentine

- F.H. Sanchez (97)
- L. Mendoza - Zelis (2000)

**Dpto de Fisica** - Universidad Nacional de La Plata - CC67 - 1900 La Plata - Argentina

**Dpto de Fisica** - UNLP - CC 67 - 1900 La Plata - Argentine

### Australie

- A. Calka(1997)
- S.J. Campbell
- Y. Chen (1997)
- J. Harrowfield (1999)
- F.J. Lincoln
- J. Nikolov
- W. Kaczmarek

**Dep. Materials Engineering** - University of Wollongong - NSW 2522 - Australie

**School of Physics** - University College - The University of New South Wales - Australian Defence Force Academy - Canberra ACT 2600 - Australie.

**Dep.Elec. Mat. &Eng.** - RSPHYSSE - The Australian Nat. Univ. - Canberra ACT 0200 -

**Chemistry Department - Un. of Western Australia** - Nedlands - WA 6907 - Australie

**Special Research Centre for Advanced Mineral and Materials Processing** -

Univ. Western Australia - Nedlands, Perth - Western Australia 6907 - Australie

The Australian National University - Canberra ACT 0200 - Australie.

**Dpt Appl. Mathematics** - Institute of Advanced Studies - Research School of Physical Sciences & Engineering - The Australian National University - Canberra ACT 0200 - Australie.

### Brésil

- W.J. Botta - Filho
- A. de Matos Dias
- R. S. de Figueiredo(97)
- G.F. Goya

**Dept. Eng. Mater.** -Univ. Federal Sao Carlos - CP 676 - 13565 - 090 - Sao Carlos Sp. - Brésil

**Materials Science & Eng. Dpt** - Universidade Luterana do Brasil - Canoas - RS - Brésil

**Lab. Magn.& Mat. Magn.** - Dep. de Fisica - Cxp 6030 - 60.455 - 760 Fortaleza CE - Bresil

Lab. Materiais. Magneticos - Instituto de Fisica - Univ. Sao Paulo - CP 66318 - Brésil

### Canada

- J. Huot (1999)
- J.-Y. Huot
- L. Roué (1998)
- A. Van Neste
- Canada
- W.J. D. Shaw

**IREQ - Techn. des Matériaux** - 1800 Boul. L. Boulet - Varennes, Quebec, Canada J3X ISI

**Noranda Technology Centre** - 240 Hymus Blvd - Pointe Claire - Que, H9R 1G5 - Canada

**INRS - En. & Mat.**- 1650 Bd Lionel Boulet - Case Postale 1020 -Varennes (Québec) J3X 1S2 •

Mines & Métallurgie - Un. de Laval - Pav. Pouliot, Ste - Foy Campus - GIK 7P4 - Quebec -

Dept. Mech. Eng. - University Calgary - T2N 1N4 - Calgary Alberta - Canada

### Chine

- J. Li
- K. Lu
- Yijun Sun
- L. Wei

**Dept Materials Science** - Lanzhou University - Lanzhou 73000 - Chine

State Key Lab for RSA - Institute of Metal Research - Chinese Academy of Sciences - Shenyang 110015 - P.R. Chine

865 Changning Road - Shangai Institute of Metallurgy - Chinese Academy of Sciences Shanghai 200050 - Chine

Institute of Metal Research - Chinese Academy of Sciences - Shenyang, 110015 - P.R. China

### Corée du Sud

- J.-H. Ahn
- S. H. Hong

**Dept. Materials Engineering - Andong National University**

388 Songchon - Dong, Andong, Gyungbuk 760 749 - Corée du Sud

**Dept. Mat. Sci. & Eng. - Korean Advanc. Inst. of Science and Technology**

373 - 1 Kusong - Dong, Yusung - Gu - Taejon, 305 - 701 - Corée du Sud

### Croatie

- M. Stubicar (1998)
- Andjelka. Tonejc

**Department of Physics** - Faculty of Science, P.O. Box 162 - 10001 Zagreb - Croatie

**Dpt Physics** - Lab. Microstr. Investig. - Bijenicka 32 - PO Box 162 - 10001 Zagreb - Croatie

- Antun Tonejc

**Dpt Physics** - Lab. Microstr. Investig. - Bijenicka 32 - PO Box 162 - 10001 Zagreb - Croatie

## Danemark

- J. Z. Jiang

**Dept Physics** - Tech. Univ. Denmark - Bldg 307 - DK 2800 - Lyngby - Danmark

## Espagne

- P. Crespo(1997)

**CENIM - CSIC**, Avda G de Amo, 8 - 28040 - Madrid Espagne

## Grèce

- G. Kiriakidis

**Materials Group** - Institute of Electronique Structure and Laser (IESL)  
Foundation for Research and Technology - Hellas (Forth)  
Science & Technology Park of Crete - Vassilika Vouton, Heraclion Crete  
P.O Box 1527 GR - 71110 - Grèce

## Hongrie

- T. Kemeny (1997)
- I. Dekany
- L.K. Varga

Research Institute for Solid State Physics - 1525 Budapest - P.O. Box 49 - Hongrie  
Attila Jozsef University - Dept of Colloid Chemistry - Aradi Vt 1 - H 6720 Szeged - Hongrie  
Research Institute for Solid State Physics - P.O.B. 49 - H- 1525 - Hongrie

## Inde

- B.S. Murthy

Dpt Metallurgical & Materials Engineering - Indian Institute of Technology -  
Kharagpur - 721 302 - Inde

## Israel

- M.P. Dariel (1998)
- N. Frage
- A. Gedanken
- E. Gutmanas

**Dept. Materials Engineering** - Ben Gurion University of the Negev - Beer Sheva - Israel  
**Dept. Materials Engineering** - Ben Gurion University of the Negev - Beer Sheva - Israel  
**Dpt of Chemistry** - Bar - Ilan University - Ramat - Gan; Israel 52900  
**Technion** - Israel

## Italie

- D. Basset (1998)
- S. Enzo
- F. Carli
- M. Magini (1997)
- F. Mantovani
- P. Pierrat\*

M.B.N. srl - Via Roma - 4 - I31020 - San Vendemiano (TV) Italie  
**INFM & Dipartimento di Chimica** - Univ. Sassari - Via Vienna 2 - 07100 Sassari - Italie  
Vectorpharma SpA, Via del Follatoio 12, 34100 Trieste - Italie  
**ENEA** - Dipart INNOVAZIONE - C.R. Casaccia - Via Anguillarese, 302 - I00060 Rome - Italie  
Vectorpharma SpA, Via del Follatoio 12, 34100 Trieste - Italie  
**Dipartimento di Scienze e Technologie Chimiche**  
Università degli Studi di Udine - Via del Cotonificio 108 - 33100 Udine - Italie

## Japon

- T. Aizawa
- J.Y. Huang
- M. Senna
- M. Umemoto

Dpt of Metallurgy - University of Tokyo - Japon  
Nat. Inst. Research in Inorganic Materials (NIRIM) - Namiki 1 - 1, Tsukuba, Ibaraki -305 Japon  
Keio Univ.-Fac. Sci. Tech. -Dpt. Appl. Ch.- 3-14-1 Hiyoshi Kohoku-ku-223 Yokohama - Japon  
**Fac. Engin.** - Toyohashi Univ. Technology - Tempaku - Cho Toyohashi Aichi 441 - Japon

## Pologne

- T. Jańta
- D. Oleszak
- B. Weglinski

**Technical University of Wroclaw** - Inst. of Electric Machines & Drive - Wybrzeze  
Wyspianskiego 27 - Wroclaw 50 - 370 - Pologne  
**Dept Mater. Sci.& Eng.** - Warsaw Univ. Techn. - Nabutta 85 - 02 - 524 - Pologne  
**Technical University of Wroclaw** - Inst. of Electric Machines & Drive - Wybrzeze  
Wyspianskiego 27 - Wroclaw 50 - 370 - Pologne

## Portugal

- B. Oliveira e Costa (99)

**Dpto de Fisica** - Faculdade de Ciencias et Tecnologia - Universidade de Coimbra -  
3000 Coimbra - Portugal

## Roumanie

- M. Lozovan

National Institute of R&D for Technical Physics, 47 Mangeron Blvd, 6600 IASI 3 - Roumanie.

## Russie

- N.Z. Lyakhov
- R.Z. Valiev
- A.N. Strelestskii
- A. Y. Yermakov
- A.Y. Zubarev

**Inst. Sol. State Chem.**- Russian Acad Sci. - Kutaleladze, 18 - Novosibirsk - 630128 Russia  
**Ufa State Aviation Technical University** - Inst. of Physics of Advanced Materials -  
12 K. Marks Str., UFA 450000 - Russie  
**Inst. Chem. Phys.** - RAS, Dept Kinetics & Catalysis - Kosygina Str. 4 - Moscou - Russie  
**Applied Magnetism Lab.** - InstituteMetal Physics - 18 S. Kovalevskaya St. - GSP -  
170 - Ekateringurg - 620219 - Russie  
USU - Russie

## Singapour

- Lu Li

Dpt Mechanical and Production Engineering - The National University of Singapore -  
10 Kent Ridge Crescent - Singapore - 119260 - Singapour

## Slovaquie

- P. Balaz
- K. Kristiakova

Institute of Geotechnics - Watsonova 45 - 04353 Kosice - Slovaquie  
Institute of Physics - Dubravska Cesta 9 - SK - 842 28 Bratislava - Slovaquie

## Suède

- L.B. Kiss
- A. Salwen
- S.J. Savage

Nanomaterials and Noise Projects - Dpt Materials Science - The Angstrom Lab. Uppsala Univ.  
P.O. Box 534 - Uppsala, SE - 75121 - Suède  
**Swedish Inst. Metals Res.** - Drottning Kristinas V. 48 - Stockholm S 114 - 28 - Suède  
**Dept of Materials** - Defence Research Establishment - SE - 172 90 - Stockholm - Suède

## Suisse

- D. Morris (1998)

Université de Neuchâtel - Institut de Métallurgie Structurale - CH 2000 Neuchâtel

## Tunisie

- T. Benameur

Dpt de Génie Mécanique - ENIM - Université du Centre - 5019 Route de Kairouan - Tunisie

## U.S.A.

- P. Bellon
- Xiabao Fan
- E. Y. Ivanov
- J.N. Newkirk
- R.E. Riman
- L. Takacs (98)

**Dpt Materials Science and Engineering** - 1304 W. Green St. - Urbana IL 61801 - USA  
**Nanomaterials Research Corporation**-2620 Trade Centre Avenue-Longmont  
CO80503-USA  
**Tosoh SMD Inc.**, 3600 Gantz Road, Grove City - Ohio 43123 USA  
**Dept Metallurgical Eng.** - Univ. Missouri - Rolla - Rolla MO 65409 USA.  
**Dept Ceramic and Materials Engineering** - Rutgers University -  
P.O. Box 909 - Piscataway, NJ 08855 - 0909 USA  
Univ. Maryland - Baltimore Country - Dpt Physics - 1000 Hilltop Circle - USA

## Viet Nam

- Pham Khac Hung
- To Ba Van

ITIMS - 1 Round, Dai Co Viet, Hanoi Viet Nam  
Institute of Materials Science - HCMC Branch, NCST 01 Mac Dinh Chi, Dist 1 -  
Hochiminh City - Vietnam

## France

- H. Ageorges\*
- M. Arigon (1998)
- L. Aymard
- D. Aymes (1997)
- J-R Authelin (1999)
- M.-I. Baraton (1997)
- J.-F. Baumard\*
- S. Begin - Colin (1998)
- K. Ben Djemiaa (1999)
- F. Bernard \*
- Ph. Blanchard (1997)
- J.L. Bobet (1998)
- A. Briantais (1997)
- J.-M. Castillo (1997)
- L. Chaffron \*
- F. Charlot\*
- P. Chartier (1997)
- B. Cheng (1997)
- G. Cornella\*
- D. Cracco (1998)
- A. Demortier (1998)
- C. Djega - Mariadassou\*
- J. Dodds (1997)
- E. Duverger (1997)
- O. El Kedim (1997)
- J.-P. Eymery (1998)
- N. Feninèche (1997)
- A. Fnidiki (1998)
- J. Foct (1997)

**Lab. Thermodyn. Trait. Poudres** - Fac. Sciences - 2 Bd Lavoisier - F49045 - Angers Cedex  
**Roucaire Instruments Scientifiques** - 2, Avenue du Pacifique, Les Ulis - BP 78  
F91943 Courtaboeuf Cedex  
**LCRS** - 33 Rue de Saint Leu - F80039 - Amiens Cedex  
**LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins" - Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex  
Rhône Poulenc Rorer - Responsable du Service Qualite Phiyique (Dpt Procédés)  
Centre de Recherches de Vitry Alfortville - 94400 Vitry / Seine Cedex  
**LMCTS ESA 6015** - Fac des Sciences 123 Avenue A. Thomas - F87060 Limoges Cedex  
**ENSCI** - 47 Avenue A. Thomas - F87065 Limoges Cedex  
**LSG2M- CNRS**- Ecole des Mines - F54042 - Nancy Cedex  
Rhône Poulenc Rorer - Responsable du Service Qualite Phiyique (Dpt Procédés)  
Centre de Recherches de Vitry Alfortville - 94400 Vitry / Seine Cedex  
**LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins"  
Faculté des Sciences de Mirande - BP 138 - F21004 - Dijon Cedex  
**Saft Recherche** - Route de Nozay - F91460 Marcoussis  
ICMCB - Bordeaux  
**CREPI - PSA** - Direction des Methodes et Equipements Industriels - Batiment Forge  
Route de Chalampé - BP 1403 - F68071 Mulhouse Cedex  
**Faure Equipements** - BP 52 - 21 Rue Santos Dumont - F87002 Limoges Cedex  
**CEN Saclay** - DTA / CEREM / DECM / SRMP - F91191 - Gif/Yvette Cdx  
**LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins" - Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex  
**Lab. Métal. Phys.**- URA CNRS 131 - Bd 3, Téléport 2 - BP 179 -F86960 - Futuroscope Cedex  
**LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins" - Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex  
**Schneider Electric** - Dir. Rech. Matériaux/A3 - Rue Henri Tarze - F38050 - Grenoble Cedex 9  
CNRS - Lab de Chimie Métallurgique des Terres Rares - 2 - 8 Rue H. Dunant - F94320 Thiais  
LASIR - HEI (CNRS UPR 2631) - 13 Rue de Toul - F59046 Lille Cedex  
**Lab. de Structure des Mat. Métal.** - Bât. 413 - 414 - Un. Paris Sud - F91405 - Orsay Cedex  
**Ecole des Mines d'Albi** - Campus Jarlard - F81013 Albi Cedex 04  
**LMIT** - IUT Belfort - BP 527 - 90016 - Belfort Cedex  
**Laboratoire de ThermoMécanique** - IPSé - F90010 - Belfort Cedex  
**Lab. Métal. Phys.** - URA CNRS 131 - Bd 3, Téléport 2 - BP 179-F86960 - Futuroscope Cedex  
**Laboratoire de ThermoMécanique** - IPSé - F90010 - Belfort Cedex  
**Lab. Magn. & Appl.** -URA 808 -Univ. Rouen-UFR Sci.& Tech-F76821 - Mt St Aignan Cdx3  
**Lab. de Métallurgie Physique** Univ. Lille 1 - Bat C6 - 2ème Et. -F59655 - Villeneuve d'ascq

- J. - O. Fourcade (1997) **LPMS - CNRS D0407** - Univ. Montpellier II - Sci. et Techn. du Languedoc  
Place E. Bataillon - F34095 - Montpellier Cedex 5
- D. Fruchart (1998) **Lab. de Cristallographie** - UPR CNRS 5031 - BP 166 - F38042 - Grenoble Cedex
- J. - C. Gachon (1999) **Lab. Thermodyn. Mét.** - URA CNRS 158 - Univ. Nancy I - B.P. 239-54506-Vandoeuvre Cdx
- E. Gaffet (1997) **CNRS UPR 423** "Elab. et Transitions de Phases Hors Equilibre"-IPSé -F90010 - Belfort Cedex
- J.P. Ganne (1997) **Lab. Central de Recherches** - Thomson CSF Domaine de Corbeville - F91404 - Orsay
- T. Giroto (1998) **LSG2M- CNRS**- Ecole des Mines - F54042 - Nancy Cedex
- C. Goujon (1998) Ecole des Mines - St Etienne - France
- F. Goutenoire (1998) **Lab. Fluorures** - UPRES CNRS A 6010 - Fac des Sciences - Av. O. Messiaen - 72985-Le Mans Cdx
- C. Gras **LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins"- Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex
- J- M. Greneche \* **Eq. Physique de l'Etat Condensé** - Univ. du Maine - Fac Sciences - F72017 - Le Mans Cdx
- T. Grosdidier (1998) **LETAM** - Université de Metz - 57045 Metz Cedex 01
- D. Guerard (1997) **Lab. Chimie du Sol. Minéral - CNRS** - B.P. 239 - Vandoeuvre les Nancy Cedex
- P. Guigon (1998) **Université de Compiègne - Génie Chimique** - BP 529 - F60205 - Compiègne
- B. Guilhot\* **ENSMSE - Lab. Physicochimie Matériaux** - 158 Cours Fauriel - F42023 St Etienne Cdx
- V. Hays\* **Lab. de Génie des Matériaux** - ISITEM - CP3023 - F44087 - Nantes cedex 03
- F. Hehmann (1999) ONERA - Chatillon - France
- J. - C. Jumas (1997) **LPMS - CNRS D0407** - Univ. Montpellier II - Sci. et Techn. du Languedoc  
Place E. Bataillon - F34095 - Montpellier Cedex 5
- Ph. Kapsa (1998) **Lab. Tribologie & Dynamique des Systèmes** - UMR CNRS 5513  
Dpt de Technologie des Surfaces - Ecole Centrale de Lyon, BP 163 - F69131 Ecully Cedex
- D. Klein **LMIT** - Portes du Jura - F25000 Montbéliard
- F.A. Kuhnast (1999) **LCSM - UMR 7555 CNRS / Univ. H. Poincaré** - Nancy I - F54506 Vandoeuvre Cedex
- Y. Labaye\* **Eq. Physique de l'Etat Condensé** - Univ. du Maine - Fac Sciences - F72017 - Le Mans Cdx
- P. Lacorre(1998) **Lab. Fluorures** - UPRES CNRS A 6010 - Fac des Sciences - Av. O. Messiaen - 72985-Le Mans Cdx
- M. Latroche **LCMSTR - CNRS** - 1 Place A. Briand - F92195 - Meudon Cedex
- G. Le Caër (1999) **LSG2M- CNRS**- Ecole des Mines - F54042 - Nancy Cedex
- N. Lecomte (1997) **Ressources en Innovation** - 49 Rue Edouard Herriot - F69002 Lyon
- J.M. Lecuire (2000) **Lab. d'Electrochimie des Matér.** - Univ. de Metz - Ile de Saulcy - F57045 - Metz Cedex
- C. Lemoine (1998) **Lab. Magn. & Appl.** -URA 808 -Univ. Rouen-UFR Sci.& Tech-F76821 - Mt St Aignan Cdx3
- C. Lenain **Lab Réactivité & Chimie des Solides** - CNRS Université d' 80039 Amiens - France
- S. Lenard **Univ. Metz - 57 Metz**
- C Levaillant (1998) **CEN Matériaux** - Ecole Mines d'Albi Carmaux - Rue de la Poudrière-F81013 - Albi Cedex 09
- N. Lorrain (1998) **CEN Saclay** - DTA / CEREM / DECM / SRMP - F91191 - Gif/Yvette Cdx
- B. Malaman (1998) **Labo de Chimie Minérale** - Univ. de Nancy I - B.P. 239 - F54406 - Vandoeuvre Cedex
- C. Massobrio (1997) **IPCMS - Groupe Etude Matériaux Métal.** - 23 Rue du Loess - F67037 - Strasbourg Cedex
- C. Meunier (1998) **LMIT** - Portes du Jura - F25000 Montbéliard
- D. Michel (1997) **CECM / CNRS** - 15 Rue G. Urbain - F94407 - Vitry / Seine Cedex
- P. Millet\* **CEMES** - UPR CNRS 8011 - 29 Rue Jeanne Marvig - BP 4347- F31055 Toulouse Cedex
- N. Millot\* **LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins"- Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex
- Ph. Molinié (1999) **IMN** - UMR CNRS 110 - 2 Rue de la Houssinière - BP 32229 - F44322 - Nantes Cedex 03
- C. Monty (1998) **IMP** - CNRS - BP5 - Odeillo - F66125 Font Romeu Cedex
- M. Nakach (1999) **Rhône Poulenc Rorer** - Responsable du Service Qualite Phiyique (Dpt Procédés)  
Centre de Recherches de Vitry Alfortville - 94400 Vitry / Seine Cedex
- F. Nardou (1997) **LMCTS**- Eq. "Céramiques Nouvelles" - 123 Avenue Albert Thomas - F87060 - Limoges Cedex
- M. Nakhil (1998) **ICMCB** - Bordeaux
- G. Nicolas (1998) **CIME Bocuze SA** - BP 301 - St Pierre en Faucigny - F74807 - La Roche / Foron Cedex
- J.-C. Niepce\* **LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins"- Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex
- V. Nivoix (1998) **Lab. d'Analyse de Spectroscopie et de Traitement de Surface des Matériaux** - Université de Rouen  
LASTSM - I.U.T. - 76821 Mont St Aignan Cedex - France
- F. Pellerin **Turboméca** - 64511 - Bordes Cedex
- A. Percheron-Guegan(98) **CNRS** - Lab de Chimie Métallurgique des Terres Rares - 2 - 8 Rue H. Dunant - F94320 Thiais
- P. Perriat\* **LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins"- Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex
- P. Pochet\* **GEMPPM** - INSA Lyon - Bat 303 - 69621 Villeurbanne Cedex
- R. Rahouadj\* **Laboratoire de ThermoMécanique** - IPSé - F90010 - Belfort Cedex
- N. Randrianantoandro \* **Eq. Physique de l'Etat Condensé** - Univ. du Maine - Fac Sciences F72017 - Le Mans Cdx
- D. Ravot **Lab. Phys. Mat. Cond.**-Univ. Montpellier II-Place E. Bataillon-F34095-Montpellier Cdx5
- R. Retoux (1998) **Lab. Fluorures** - UPRES CNRS A 6010 - Fac des Sciences - Av. O. Messiaen - 72985-Le Mans Cdx
- S. Revol (1998) **CENG- CEREM** - 17 Rue des Martyrs - F38054 - Grenoble Cedex 9
- S. Rimlinger (1997) **CERMEP** - 54 Avenue Rhin et Danube - B.P. 62 - 38041 Grenoble Cedex 9
- B. Rondot\* **LMIT** - IUT Belfort - BP 527 - F90016 - Belfort Cedex
- M. Sarfati (1997) **ETCA** - 16 bis avenue du Prieur de la Cote d'Or - F94114 Arcueil Cedex
- H. Scherrer\* **LSPM - URA CNRS 155** - Ecole des Mines - Parc de Saurupt - F54042 - Nancy Cedex

- G. Silly\*
  - H. Souma (1997)
  
  - N. Spath (1997)
  - M. Stamm (1997)
  - J. Steinmetz (1998)
  - H. Szwarc (1998)
  - J. Teillet (1998)
  - F. Thévenot (1999)
  - I. Tkatchenko (1997)
  - A. Tousimi (1999)
  - A. Venot (1997)
  - R. Welter (1997)
  - R. Yavari
  
  - M. Zeghmati (98)
  - M. Zouggar (1998)
  - C. Zinc \*
- Cdx

**Eq. Physique de l'Etat Condensé** - Univ. Maine - Fac Sciences - F72017 - Le Mans Cedex  
**LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins" - Université de Bourgogne  
UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex  
**Comptoir Lyon - Alemand - Louyot**- CR - 8, Rue Portefoin - F75003 - Paris  
**C2M Technology** - C.E.E.I Zone Industrielle Ste Agathe - Rue Lavoisier- F57192 - Florange  
**Labo de Chimie Minérale** - Univ. de Nancy I - B.P. 239 - F54406 - Vandoeuvre Cedex  
Lab. Chimie Phys. Mat. Am. - CNRS URAD1104 - Bat. 490 - Univ. Paris Sud - Orsay F91405  
**Lab. Magn. & Appl.** -URA 808 -Univ. Rouen-UFR Sci.& Tech-F76821 - Mt St Aignan Cdx3  
**ENSMSE** - Lab. Céramiques Spéciales - 158 Cours Fauriel - F42023 - Saint Etienne Cedex  
**CNRS/ Institut Recherche Catalyse** - 2 Avenue A. Einstein -F69626 Villeurbanne Cedex  
LTPCM INPG / CNRS - 1130 Rue de la Piscine - Domaine Univ.- BP 75 38042 St Martin d'Hères  
**SINTERTECH** - Centre R & D- Voie des Collines - F38800 Le Pont de Claix - France  
**Labo de Chimie Minérale** - Univ. de Nancy I - B.P. 239 - F54406 - Vandoeuvre Cedex  
**INPG - LTPCM - CNRS URA 29** - ENSEEG, 1130 Rue de la Piscine  
Domaine Univ. - BP 75 - F38042 - Saint Martin d'Hères - France  
**LMIT** - IUT Belfort - BP 527 - F90016 - Belfort Cedex  
**Lab. Métal. Phys.**- UMR 6630 - Bd 3, Téléport 2 - BP 179 -F86960 - Futuroscope Cedex  
Thann & Mulhouse, Usine de Thann-Serv. PCA-95 Rue du Gal de Gaulle BP 34- 68801 Thann

**Les membres du RFM ayant déjà réglé leur cotisation sont indiqués sur l'annuaire par (1998)**  
**(Members having paid the RFM contribution are indicated by (year) in the RFM list)**

**Bulletin d'adhésion 1999 / Subscription Print**

*(à retourner à l'adresse suivante - to be sent at the following address) :*

**Eric GAFFET**

UPR CNRS 423 - Groupe "Nanomatériaux : Elaboration et Transitions de Phases Hors Equilibre"  
IPSé - F90010 - Belfort Cedex - France

**Nom/Name :** ..... **Prénom / First Name :** .....

**Adresse complète / Full Address :** .....  
.....  
.....

**Téléphone/ Phone:** ..... **Télécopie (Fax) :** .....

**e\_Mel. / e-Mail :** .....

désire adhérer au Réseau Français de Mécanosynthèse /want to be a member of the French Mechanical Alloying Network

**Chèque ci joint / Check enclosed in the amount of 100FF**

**(Please do not use Eurocheck, the taxes do correspond to 40% of the amount of the check).**

**N.B. :** Pour la rédaction du prochain N° de la Lettre du Réseau Français de Mécanosynthèse, tout(e) article, annonce, thèse ... peut être envoyé(e) à : Eric Gaffet - CNRS UPR A0423  
Groupe "Nanomatériaux : Elaboration et Transitions de Phases Hors Equilibre"  
IPSé - F90010 Belfort Cedex  
Tél. : 84 - 58 - 31 - 02 / Fax : 84 - 58 - 30 - 27  
E-mail : Eric.Gaffet@utbm.fr

# JRFM'99

4 èmes Journées du Réseau Français de Mécanosynthèse  
Dijon (ESIREM) - les 2-3 Juin 1999

## Programme

-----

# Thématique 1999 : Mécanosynthèse : Réactivité et Mécanique

### Fiche d'Inscription définitive

Nom: .....Prénom: .....

Adresse:.....

.....

Téléphone : ..... Fax : .....E-mail : .....

Participera aux JRFM99 qui se dérouleront à Dijon (Bât. Sciences pour l'Ingénieur ) les 2 et 3 juin:

**Frais d'inscription** : (+ recueil des résumés, 2 déjeuners, 1 diner)

Repas du 2 juin midi                    oui / non

Repas du Banquet du 2 juin soir :    oui /non

Repas du 3 juin midi :                oui /non

(Prière d'entourer les réponses)

Etudiant(e) en thèse : 100 FF        Autres : 400 FF

Les frais d'inscription comportent l'adhésion au RFM au titre de 1999. Pour ceux ayant déjà réglé leur adhésion, celle ci est reportée sur l'année 2000 (afin de simplifier la comptabilité).

### **Mode de paiement :**

Bon de commande ou chèque libellé à l'ordre du Réseau Français de Mécanosynthèse.

-----

### **Date limite d'Envoi des Résumés : 30 Avril 1999**

Possibilité de soumettre un article. Après sélection, les articles proposés pourront être publiés dans *Journal of Metastable and Nanocrystalline Materials* (J. Metastable & Nano. Mater. - Trans Tech Publ.) *Editors* : A.R. Yavari, A. Inoue, R. Schulz, D. Morris  
*Int. Editorial Board*, : J.H. Ahn, H. Bakker, M.D. Baro, R. Bormann., A. Calka, G. Cocco, J. Eckert, E. Gaffet, S. Gialenella, A. Hernando,, A. Inoue, C. Koch, G. Le Caer, M. Magini, D. Morris, P.H. Shingu,, L. Schultz, R. Schulz

### **Fiche d'inscription, règlement (à l'ordre du RFM) et résumés à retourner à**

Frédéric BERNARD (Journées RFM99), Laboratoire de Recherches sur la Réactivité des Solides  
(UMR5613 CNRS - Université de Bourgogne), 9 avenue Alain Savary, BP 400, 21011 Dijon

Cedex. (Tel : 03.80.39.61.25 - fax : 03.80.39.61.67, E-mail : fbernard@u-bourgogne.fr)

**(PS : Le PLUS tôt Possible)**

## **Comité d'organisation**

**Frédéric Bernard** et toute l'équipe " Matériaux à Grains Fins "  
Laboratoire de Recherches sur la Réactivité des Solides  
(UMR 5613 CNRS - Université de Bourgogne),  
9 avenue Alain Savary, BP 400, 21011 Dijon Cedex.  
Tel : 03.80.39.61.25 - Fax : 03.80.39.61.67,  
E-mail : fbernard@u-bourgogne.fr

**&**

**Eric Gaffet** - Président du Réseau Français de Mécanosynthèse  
Groupe "Nanomatériaux" - CNRS UPR 806  
Université de Technologie de Belfort - Montbéliard (UTBM)  
Site de Sévenans  
90100 Belfort Cedex.  
Tél : 03 84 58 31 02 - Fax : 03 84 58 30 27  
E-mail : Eric.Gaffet@utbm.fr

## Programme Scientifique

### Mercredi 2 juin 1999

Accueil et mise en place des Posters 11h à 13h

- 13h15 : Repas
- 14h15 – 15h15 : **Mécanochimie : Bilan et Perspectives**  
J.C.MUTIN (LRRS CNRS - Univ Dijon).
- 15h15 – 15h35 : **Co - broyage de poudres pharmaceutiques**  
M. Baron – (Ecole des Mines d'Albi)
- 15h35 – 15h55 : **Mécanochimie de basse énergie : le cas du nitrure de bore**  
M. Gasnier, H. Szwarc - ICMO – (Lab. Chimie Inorganique – Orsay)
- 15h55 – 16h15 : **Transformation directe Hématite (-Fe<sub>2</sub>O<sub>3</sub>) – Maghemite (- Fe<sub>2</sub>O<sub>3</sub>) par broyage haute énergie**  
-  
N. Randrianantoandro(1), A.M. Mercier (2), M. Hervieux (3) et J.M. Grenèche (1)((1) LPEC UPRES A 6087 LE MANS (2) Laboratoire des Fluorures UPRES A 6010- LE MANS -(3) Laboratoire CRISMAT, ISMRA 14050 CAEN Cedex
- 16h15 – 17h15 : Session poster + Pause Café
- 17h15–17h35 : **Mécanosynthèse appliquée au système binaire Mg - Co. Réactivité avec l'Hydrogène**  
J.-L. Bobet, B. Darriet, E. Akiba – (ICMCB – Bordeaux)
- 17h35 – 17h55 : **Rôle de l'activation mécanique sur la synthèse du composé Cu<sub>3</sub>Si**  
H. Souha, F. Bernard, E. Gaffet, JC Niepce – (UMR 5613 CNRS - Dijon, UPR 806 CNRS – Belfort).
- 17h55 – 18h15 : **Effet de la taille des billes lors de broyage successif par attrition : obtention de poudres nanométriques pour applications électrocéramiques**  
F. Perrot - Sipple, D. Aymes, J.C. Niepce – (UMR 5613 CNRS – Dijon)
- 18h15 – 18h35 : **Mécanosynthèse de matériaux thermoélectriques à base de tellure de plomb**  
N. Bouad, R.M. Marin-Ayral, J.C. Tedenac (LPMC, Montpellier II).
- 20h30 Repas Bourguignon au Cellier de Ste Bénigne

### Jeudi 3 juin 1999

- 8h30 –9h30 : **L'analyse microstructurale des solides à cristallisation fine par diffraction des rayons X**  
D.LOUER (CNRS- LCSIM Cristalochimie - Univ. Rennes)
- 9h30 – 9h50 : **Etude de la Microstructure d'un Nitrure d'Aluminium broyé**  
C. Goujon et al. – (Ecole des Mines de St Etienne)
- 9h50 – 10h10 : **Confinement et instauration de désordre par broyage mécanique de cristaux ioniques. Caractérisation ordre/désordre par technique de diffraction cohérente (DRX) et de sonde locale (Spectrométrie Mössbauer)**  
H. Guérault, J.M. Grenèche (*Laboratoire de Physique de l'Etat Condensé LE MANS*)
- 10h10 – 11h 00 : Session poster + Pause Café
- 11h00 –12h00 : **Peculiarities of XRDP in case of crystals with high density of planar defects**  
A.I. USTINOV, L.O. OLIKHOVSKA, N.M. STOZCHAK (Int.for Metal Physics Kiev Ukraine).
- 12h00 – 12h20 : **Elaboration et comportement en compressibilité de TiC nanostructuré**  
P. Baviera – (SP2MI Poitiers)
- 12h20 – 12h40 : **Etude de la compressibilité de la poudre de Fer Nanométrique élaborée par broyage Mécanique**  
M. Zouggar et al. – (SP2MI Poitiers)
- 12h40 – 13h00 : **Intérêt de la microencapsulation par voie physique de solides nanoparticulaires obtenus par mécanosynthèse**  
C. Roques-Carmes, E. Gaffet (LMS, ENSMM Besançon et CNRS/UTBM Belfort)  
ou **Intérêt du Rayonnement Synchrotron pour l'étude in - situ de la compressibilité des matériaux nanostructurés à hautes pressions**  
E. Gaffet, C. Meunier, S. Vives, J.-P. Itié (Belfort, Montbéliard, LURE Orsay)
- 13h15 : Repas
- 14h00 –15h00 : **Potentialités du Rayonnement Synchrotron en Mécanosynthèse**  
JF.BERAR (CNRS- Lab. de Cristallographie de Grenoble / ESRF).
- 15h00 – 15h20 : **Suivi in situ de l'élaboration du composé NbAl<sub>3</sub> par MASHS et ERAM**  
V. Gauthier, F. Bernard, E. Gaffet, JP Larpin.. (Belfort – Dijon)
- 15h20 – 15h40 : **Pièces massives obtenues par compactage à chaud de nanocomposites à matrice métallique issus de broyage réactif**  
K. Tousimi, A.R. Yavari (LTPCM - CNRS – Grenoble)
- 15h40 –16h00 : **Activation Mécanique de Réactions SHS**  
F. Charlot, E. Gaffet, F. Bernard, Z.A. Munir
- 16h00 : **Clôture des Journées RFM99 :**

E. Gaffet, G. Le Caër

## Propositions d'affiches (Posters)

- 1) **Co - broyage de poudres pharmaceutiques**  
M. Baron – (Ecole des Mines d'Albi)
- 2) **Mécanochimie de basse énergie : le cas du nitrure de bore**  
M. Gasnier, H. Szwarc –( ICMO - Lab. Chimie Inorganique Orsay)
- 3) **Influence de la mécanosynthèse sur la structure cristallographique TRNi (TR = Gd, Y, Er)**  
M. Nakhil, B. Chevalier, J.-L. Bobet, B. Darriet ( ICMCB – Bordeaux)
- 4) **Propriétés et choix de capteurs intermétalliques d'hydrogène destinés à un procédé d'oligomérisation**  
A. Sauvage, M. Mercy, JC Gachon, P. Pareja ((UMR 7555 CNRS - Univ Nancy I).
- 5) **"Structural disorder in YBa<sub>2</sub>Cu<sub>3</sub>O<sub>x</sub> synthesized by mechanical activation**  
A. Shlyachtina – (Moscou – Russie)
- 6) **Etude in situ par rayonnement synchrotron de la compressibilité de poudres nanostructurées obtenues par broyage mécanique à puissance contrôlée (Cas du Fe, Ni, Cu)**  
E. Gaffet, J.-P. Itié, C. Meunier, S. Vives (Belfort, LURE Orsay et Montbéliard)
- 7) **Mécanosynthèse d'alliages Fe - Mo**  
T. Ziller, G. Le Caër, P. Delcroix – (LSG2M / CNRS Nancy)
- 8) **Cinétiques de Transformations de phases induites par broyage à haute énergie de TiO<sub>2</sub> anatase en fonction de la nature du matériau de broyage et du rapport masse de poudres sur masse de billes**  
T. Girot, S. Begin - Colin, G. Le Caer, A. Mocellin – (LSG2M / CNRS – Nancy)
- 9) **Elaboration du composé FeAl nanométrique par MASHS - Suivi In situ par rayonnement synchrotron**  
F. Charlot, F. Bernard, E. Gaffet, D. Vrel - (Dijon, Belfort Villetaneuse).
- 10) **Elaboration par MASHS de siliciures FeSi<sub>2</sub> et MoSi<sub>2</sub> nanométriques**  
Ch Gras, E. Gaffet, F. Bernard, D. Vrel – (Dijon, Belfort Villetaneuse).
- 11) **Etude des propriétés magnétiques des alliages nanocristallins FeCr élaborés par mécanosynthèse.**  
C. Lemoine, A. Fnidiki (UMR 6634 CNRS – Université de Rouen)
- 12) **Texture and microstructure in Al - Al<sub>3</sub>Ti bars obtained by extrusion of MA powders**  
S. Lehnard, K. Helming, C.P. Chang, F. Wagner, T. Grosdidier  
(LETAM - URA CNRS 2090 - Metz // IMM Clausthal - Zellerfeld (D) // Sun Yat - Sen University (R.O.C.))
- 13) **Texture and microstructure development in ECAE processed ultra fine grained copper**  
A. Tidu, T. Grosdidier (LETAM - URA CNRS 2090 - Metz).
- 14) **Etude de l'amorphisation par mécanosynthèse de l'alliage Al<sub>33</sub>Ni<sub>16</sub>Zr<sub>51</sub> et analyse des phases observées après retour à l'équilibre.**  
J.P. Braganti, O. Held, F.A Kuhnast (UMR 7555 CNRS - Univ Nancy I).
- 15) **Calorimétrie et diffraction X en temps réel de la cristallisation d'alliages d'amorphes NiTi produits par mécanosynthèse.**  
O. Held, J.P. Braganti, D. Vrel, F.A. Kuhnast (UMR 7555 CNRS - Univ Nancy I).
- 16) **RMN des noyaux quadripolaires <sup>69</sup>Ga et <sup>71</sup>Ga dans GaF<sub>3</sub> après broyage haute énergie.**  
B. Bureau, H. Guerault, G. Silly, J.Y. Buzare, J.M. Greneche (LPEC UPRES-A 6087 Université du Maine)
- 17) **Mécanosynthèse de matériaux thermoélectriques à base de tellure de plomb.**  
N. Bouad, R.M. Marin-Ayral, J.C. Tedenac (LPMC, Montpellier II).
- 18) **Mössbauer studies of phase separation in mechanically alloyed FeCrSn alloys.**  
B.F.O. Costa, G. Le Caer, B. Luyssaert, P.J. Mendes, N. Ayres de Campos (Coimbra Portugal et LSG2M Nancy)
- 19) **Elaboration et caractérisation physico - chimique de matériaux nanostructurés à gradients de propriétés**  
O. El Kedim, H.S. Cao (UTBM & CNRS).
- 20) **Mécanosynthèse d'aimants permanents.**  
G. Khelifati (L.M.A. / U.M.R. CNRS 6634 Université de ROUEN)
- 21) **Texture and mechanical alloying in Nb-Ti multilayered wire drawn composites.**  
R. Taillard, A. Ustinov, A. Belhadj (UMR8517 CNRS Villeneuve d'Ascq, Inst. For Metals Physics Kiev)