RESEAU FRANÇAIS DE MECANOSYNTHESE

Lettre N°50

Mai 1999

143 Groupes de Recherche

(dont 78 à l'étranger)

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

4 Nouvelles Adhésions :

K.B.R. Varma - Materials Research Center - Indian Institute of Science - Bangalore - Inde
J. Wang - Dept of Materials Science - National University of Singapore - Singapour
N. Welham - Applied Mathematics - Australian National University - Australie
N. Wu - Dept of Materials Science and Engineering - Hangzhou - Chine

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 a jour régulièrement concernant les derniers résultats dans ce domaine.

==========

ANNONCE DE CONGRES ET / OU ECOLES
CONGRESS AND SCHOOL ANNOUNCEMENTS

==========

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

NOUVEAU

XXXèmes Journées d'Etudes sur la Cinétique Hétérogène
27 - 28 Mai 1999 - ENSME - St Etienne - France
Centre SPIN - ENSME - 158 Cours Fauriel -42023-St Etienne Cedex 2

Powder Metallurgy
Summer School
29 Mai - 4 Juin 19999 - Gothenburg - Suède
E_Mail : Info@epma.com

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 adn Thn Films 99
Symposium C : Progress in Computational Materials Science
Symposiym 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
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 - Website: www.mpif.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; 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; T. Tsakalakos, Rutgers University, Department of Ceramics and Materials Engineering, Piscataway, NJ 08854, FAX: 732-445-3229, EMAIL: 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
Fucntional Polymers
Magnetic Materials
Organic Nanostructures
Molecular Crystals and Crystal Engineering
Computational Chemistry and Materials for Electronic

Advanced Materials - Nanostructured Systems

15 - 17 Juilllet 1999 - Hong Kong
1st workshop of the new IUPAC series :
"New Directions in Chemistry
Theory, Nanoparticles, Quantum Dots,
Bio - Inspired Structures, Applications to Nanotechnolog
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 - Moscu - Russie
E_Mail : TLowe@lanl.gov and Valiev@ippm.rb.ru

IAC - 2

2nd International Alloy Conference
8 - 13 Aout 1999 - Davos - Suisse
Website : www.engfnd.org

"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- Allemage
E_Mail : euromat@dgm.de
Web Site : http://www.euromat.fems.org

NOUVEAU

Elaboration et Transformation des Solides Divisés

(Ecole Thématique)
21 - 24 Septembre 1999 Carry le Rouet - France
Renseignements : F. Gruy - ENSM St Etienne
E_Mail : gruyemse.fr

Int. Symp. Cluster and Nanostructure Interfaces (ISCANI)
25 - 29 Octobre 1999 - Richmond USA
website : http://www.vcu.edu/ISCANI/

NOUVEAU

J.A. 99 / SF2M

2- 5 Novembre 1999 - ENSAM / Paris - France
Les matériaux pour les microactionneurs et microcapteurs
Les mécanismes de renforcement dans les polymères& élastomères
Matériaux Magnétiques de Grande Diffusion
Tribologie, Contact Métal - Outil lubrifiant en laminage à froid
Surface et Interface Métallique
Surface et Revêtement
Solidification
Les Imageries de l'angstrom au micron
Les Matériaux pour le Bâtiment
Adresse : SF2M - 1 Rue de Craiova - 92024 Nanterre Cedex

EURO PM99

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

NOUVEAU

MRS Fall Meeting 99

29 Novembre - 3 Décembre 1999 - Boston MA - USA
Website : http://www.mrs.org

Sintering 2000

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

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

4th EUROMECH

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

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. Stuerga, 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 - Universie 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. Dauger, 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 Fe2.47Mo0.53O4, de la synthèse aux propriétés magnétiques dans le système fer - vanadium $Fe_{3-x}V_xO_4$ ($0 \leq x < 2$).
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:

Assoc. Prof. Jianzhong Jiang
Department of Physics, Building 307
Technical University of Denmark
DK-2800 Lyngby, Denmark
e-mail 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
DÈpartement …nergie et MatÈriaux
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 synthesize 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 MatÈriaux
1650, bd. Lionel Boulet
Varennes, Québec, CANADA
J3X 1S2
E-Mail: HYPERLINK mailto:roue@inrs-ener.uquebec.ca / roue@inrs-ener.uquebec.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 independtly, 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 refences 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 correspondance to

Professor R.E. Riman
Rutgers University
Departement of Ceramic and Materials Engineering
607 Taylor Road
Piscataway, NJ 08854 - 8065
Riman@alumina.rutgers.edu

Brésil

Post doc to work in electron microscopy characterization of nano - structured materials.
Contact : Walter J. Botta. F. - Federal Univeristy o 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 interseted 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
http://www.aist.go.jp/NIMC/fcg/index.html

"Journal of Metastable and Nanocrystalline Materials"
Trans Tech Publications
Web Site : http://www.ttp.net under Journal and Book Series

Aims and Scope

The Journal of Metastable and Nanocrystalline Materials is devoted to the rapid diffusion of recent high quality research results concerning nanocrystalline, nanocomposite and metastable materials. The concerned nanocrystalline materials include powders and bulk or consolidated forms. Nanocomposites include natural and metal-ceramic or metal-organic materials. Metastable materials include solid solutions such as metallic glasses, bulk glass formers, new oxide/ceramic glasses and metastable crystalline polymorphs of intermetallics and other stoichiometric compounds. In this perspective, the Journal is covering the thermodynamics, preparation, structure and properties of metastable and nanomaterials. Thermodynamics and preparation methods include consideration of far-from-equilibrium processing techniques [such as vapor deposition methods, heavy deformation processing (mechanical alloying and ball milling), inert gas type condensation methods, laser, electron and other beam processing, thermal spay and others and their modelling.

Nanomaterials have a high density of interfaces and internal surfaces. Interfaces are also important in the mechanisms of phase transformations in metastable and unstable atomic configurations. The Journal therefore invites studies of nano-interphases and grain boundaries.

Improved studies of nanostructures today depend on improved nano-scale characterization methods and nano-probes thus underlining the importance for the Journal, of reporting on their evolution and applications.

Finally, properties including magnetic, mechanical, electromagnetic, electrochemical, catalytic and optical will be covered as related to the nanostructure and atomic level chemical and topological order both from applied and fundamental perspective.

Bibliographic Information
* ISSN 1422-6375 - * The first volume of this new periodical will appear in summer 1999.

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 workd 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 (Tin,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
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 - Fax : 33 1 42 65 47 76
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 a 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 fied 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 Nancrystalline 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)

[55] ON THE PREPARATION OF AMORPHOUS MG-NI ALLOYS BY MECHANICAL ALLOYING

Ji SJ. Sun JC. Yu ZW. Hei ZK. Yan L. - International Journal of Hydrogen Energy. 24(1):59-63, 1999

This paper deals with the preparation of the amorphous Mg-Ni alloys. By mechanical alloying (MA) the amorphous Mg-Ni alloys with different compositions have been prepared of pure elemental magnesium and nickel powder. The as-milled powder was characterized by X-ray diffraction analysis and transition electron microscope (TEM) observation. The results showed that the 30 < Ni < 70 at.% composition could be amorphized with a milling time strongly dependent on the starting chemical compositions. The investigation on the early stage of MA showed that the different compositions amorphized by two different paths. On the magnesium rich side of 30-70 at.% Ni, the as-milled powders first formed the intermetallic compound Mg2Ni, which subsequently destabilized into the amorphous phase. For the nickel rich side, the amorphous was obtained directly from the mechanical blend of magnesium and nickel powder by the suppression of the formation of thermodynamic equilibrium phase MgNi2.

[54] INNOVATIVE MILLING OF CERAMIC POWDERS: INFLUENCE ON SINTERING ZIRCONIA ALLOYS

Farne G. Ricciardiello FG. Podda LK. Minichelli D. - Journal of the European Ceramic Society. 19(3):347-353, 1999.

The preparation of zirconia alloys precursors was carried out by several different methods to reduce firing times and sintering temperatures. Innovative milling processes such as mechanofusion (MF) and mechanical alloying (MA) were introduced on powders prepared from traditional oxides and from pyrolytic precursors. In order to evaluate the effect of innovative milling systems, the powders and related sintered bodies were characterized by XRD, SEM, EDAX and DSC techniques.

[53] LOW-TEMPERATURE POLYMORPHISM IN TUNGSTEN TRIOXIDE POWDERS AND ITS DEPENDENCE ON MECHANICAL TREATMENTS

Cazzanelli E. Vinegoni C. Mariotto G. Kuzmin A. Purans J. - Journal of Solid State Chemistry. 143(1):24-32, 1999

The polymorphism of WO, powder samples, resulting from mild mechanical treatments and from temperature changes between 30 K and room temperature, has been investigated by using Raman spectroscopy and X-ray diffraction. A transition from the monoclinic (I) gamma-phase to the triclinic delta-phase after moderate mechanical treatments has been observed for untreated powder, just what happens when the same samples are rapidly cooled to low-temperature. Evidences of the low temperature monoclinic (II) polar epsilon-phase have been found at room temperature in samples after a stronger milling treatment. The sequence of the low-temperature phase transitions appears to be strongly dependent on the mechanical history of the powders. A new low-temperature N-phase has been observed below about 200 K in different samples: it is the main phase in commercial untreated powders, having the monoclinic (I) gamma-phase at room temperature, but constitutes only a small fraction in moderately treated powders, having the triclinic delta-phase at room temperature.

[52] MECHANICALLY ALLOYED NI/8YSZ POWDER MIXTURES: PREPARATION, POWDER CHARACTERIZATION AND SINTERING BEHAVIOR

Wilkenhoener R. Vassen R. Buchkremer HP. Stover D. - Journal of Materials Science. 34(2):257-265, 1999

A state of the art anode for the solid oxide fuel cell (SOFC) consists of a mixture of 8 mol % Y2O3-stabilized zirconia (8YSZ) and nickel particles, which form an interconnected porous structure after sintering. Coarsening of the Ni particles under SOFC working conditions has to be avoided, hence it leads to a deterioration of the anode's performance. In the present work the aim was to improve the stability of the Ni particles by a reduction of the sintering activity of nickel. For this purpose between 10 and 50% by volume of nano-sized zirconia particles have been dispersed in the nickel matrix by dry ball milling in a planetary mill. For pressed samples made of mechanically alloyed Ni with 10 vol % of 8YSZ, a homogeneous dispersion of 8YSZ particles in the Ni matrix was confirmed by transmission electron microscopy. it was confirmed by mercury porosity penetration and optical microscopy that this dispersoid structure leads to a retardation of recrystallization. Also, an essentially lowered densification during sintering was found, compared to samples made of the pure Ni powder. Samples made of mechanically alloyed Ni with a higher zirconia amount showed a higher densification during sintering and annealing than samples containing 10 vol % 8YSZ. It is assumed that this results from insufficient dispersion in these systems. The results show that mechanically alloyed nickel, with a homogeneous dispersion of 8YSZ crystallites, is a promising candidate for high temperature catalysts.

[51] CHARACTERIZATION OF MAGNETIC INKS BY MEASUREMENTS OF FREQUENCY DEPENDENCE OF AC SUSCEPTIBILITY

Peikov VT. Jeon KS. Lane AM. - Journal of Magnetism & Magnetic Materials. 193(1-3):307-310, 1999

The frequency dependence of the magnetic susceptibility in the range 10 Hz-10 kHz is used to study the effect of resin concentration, surface pH of the magnetic particles, and milling time on the dispersion process. The parameters used to fit the Cole-Cole model to experimental frequency dependences characterize the 'dispersion quality' of the inks. The low frequency susceptibility and the relaxation time of the susceptibility increase with the milling time and/or resin concentration, suggesting improved dispersion quality. For an acidic wetting resin (polyvinylchloride-acetate copolymer) the increase is more significant if the particles' surface provides basic sites for strong chemical adsorption. The dispersion quality decreases for acidic particle surfaces indicating that they do not provide adsorption sites strong enough to ensure steric stabilization of the inks.

[50] TRANSVERSE SUSCEPTIBILITY OF MAGNETIC INKS. MILLING PROCESS

Peikov VT. Jeon KS. Lane AM. - Journal of Magnetism & Magnetic Materials. 193(1-3):311-313, 1999

Transverse susceptibility (chi(tr)) tests the dispersion quality of magnetic inks by probing the small amplitude, low

frequency AC susceptibility in the presence of a perpendicular DC field. The existing theoretical model of this experiment considers only individual particles and fails to predict the changes of the susceptibility observed when aggregates are broken by milling. We have extended the model to describe milling of magnetic inks as a continuous transition from an initial state of completely aggregated, immobile particles to a final stare of monodispersed particles. Each intermediate state of the ink is represented as a combination of the initial and final states. The particles in the aggregates contribute to chi(tr) only by the oscillation of their magnetic moment with the AC field. Monodispersed particles contribute to chi(tr) by displacement of their magnetic moment and by their physical motion. This model describes quantitatively the changes of the susceptibility with milling. The increase of chi(tr) is attributed to the increased number of monodispersed particles which also effectively increases the magnetic interaction between them and accounts for the shift of the maximum susceptibility to higher DC fields.

[49] NOISE CHARACTERISATION OF BARIUM FERRITE DISPERSIONS

McCann SM. Sollis PM. Bissell PR. Onions T. - Journal of Magnetism & Magnetic Materials. 193(1-3):366-369, 1999

Structural changes in barium ferrite dispersions during the milling process have been investigated by using noise measurements of the remanent states (DC modulation noise). Doped barium ferrite particles mixed with solvents, self wetting resins and binders were dispersed using a bead mill. Samples extracted at intervals during the process were coated onto PET film and magnetically oriented before drying. Tapes slit from the coating were investigated for noise in terms of spectral and total noise power characteristics following the isothermal and DC remanent magnetisation processes. Results indicated a general reduction in noise with milling time consistent with the break up of particle agglomerates. However, changes in the spectra as milling progressed and an increase in noise at certain frequencies were attributed to the formation of stacks as particles became more mobile.

[48] MECHANO-CHEMICAL PATTERNS IN COLLAPSING GELS

Sasaki S. Maeda H. - Journal of Colloid & Interface Science. 211(2):204-209, 1999

Characteristic patterns are observed in collapsing polyion gels. The symmetry axes of these patterns were found to be in the directions of external force exerted on the gel. In the present study, we examined the roles played by the mechno-chemical properties in the formation of these patterns in the polymer matrix.

[47] SOLID-STATE AMORPHIZATION REACTION IN MECHANICALLY DEFORMED ALXHF100-X MULTILAYERED COMPOSITE POWDERS AND THE EFFECT OF ANNEALING

El-Eskandarany MS. - Journal of Alloys & Compounds. 284(1-2):295-307, 1999

Single phase amorphous AlxHf100-x alloys with a wide amorphization range (33 less than or equal to x less than or equal to 75) were synthesized by the solid-state interdiffusion of pure polycrystalline Al and Hf powders at room temperature using a rod-milling technique. The mechanisms of metallic glass formation and competing crystallization processes in the mechanically deformed composite powders were investigated by means of X-ray diffraction, differential thermal analysis, scanning electron microscopy and transmission electron microscopy. The numerous intimate layered composite particles of the diffusion couples that formed during the first and intermediate stages of milling (0-173 ks) are intermixed to form amorphous phase(s) upon heating to about 980 K by so-called thermally assisted solid-state amorphization (TASSA). The amorphization heat formation for the binary AlxHf100-x system via TASSA, Delta(a)(TASSA), was measured directly as a function of the milling time. Homogeneous amorphous alloys were also fabricated directly without heating the composite multilayered particles after milling the particles for a longer milling time (360-720 ks). This amorphization reaction is attributed to mechanical driven solid-state amorphization (MDSSA). The maximum heat formation of amorphization for the binary AlxHf100-x system via MDSSA, Delta H-a(MDSSA), was estimated. The crystallization characteristics indexed by the crystallization temperature, T-x, and the enthalpy change of crystallization, Delta H-x, were measured for the amorphous alloys formed either by the TASSA (T-x(TASSA) and Delta H-x(TASSA)) or the MDSSA (T-x(MDSSA), and Delta H-x(MDSSA)) processes. The roles of amorphization and crystallization in each process are discussed.

[46] HYDRIDING REACTIONS IN BALL-MILLED TITANIUM

Small DA. MacKay GR. Dunlap RA. - Journal of Alloys & Compounds. 284(1-2):312-315, 1999

The diffusion of hydrogen into titanium during ball milling has been investigated. A system is described that enables the milling to be done under approximately constant hydrogen pressure and allows for the continuous measurement of the quantity of hydrogen absorbed. Under appropriate milling conditions, samples may be saturated with hydrogen after milling for about 20 min. X-ray diffraction studies show that samples milled to saturation exhibit the titanium hydride structure with no evidence of residual Ti metal, and have a grain size of about 8 nm. Studies of the influence of milling conditions show that the ball-to-sample weight ratio and the number of balls are both important factors in determining the time to reach saturation. These results suggest the importance of local heating effects on the hydrogen absorption rate.

[45] PHASE TRANSFORMATIONS AND MASS TRANSPORT IN MECHANICALLY ACTIVATED LOW-TEMPERATURE FORMS OF ALUMINA

Kirichenko OA. Ushakov VA. Andryushkova OA. Ivchenko SV. Poluboyarov VA. - Inorganic Materials. 35(3):262-269, 1999

Polymorphic transformations and mass transport in mechanically activated gamma- and chi-Al2O3 were studied by x-ray diffraction analysis, dilatometry, and BET measurements. Mechanical processing of active alumina was found to reduce the temperature of corundum formation and intensify mass transport, as evidenced by the observed increase in the effective diffusion coefficient with mechanical-activation time and specific power. As a result of the fast mass transport at relatively low temperatures, the specific surface decreases notably before alpha-Al2O3 begins to form.

[44] FORMATION OF X-RAY AMORPHOUS MATERIAL DURING MECHANICAL ACTIVATION (BY THE EXAMPLE OF NACL)

Urakaev FK. Boldyrev VV. - Inorganic Materials. 35(3):302-305, 1999

A nonlinear elastoplastic model for collisions between solid particles was used to calculate the parameters of melting

and solidification at an impact-friction contact between particles being ground in various grinding machines: ball mills, disintegrators, and others. The mechanisms are considered for the formation of nanocrystalline particles and the chemical reactions accompanying solidification of thin melt layers under conditions when the local contact temperature varies at a high rate.

[43] MECHANOCHEMICAL SYNTHESIS OF NANOCRYSTALLINE ZINC FERRITE [CHINESE]

Jiang JS. Gao L. Yang XL. Guo JK. - Chemical Journal of Chinese Universities-Chinese. 20(1):1-4, 1999

Nanocrystalline zinc ferrite (ZnFe2O4) was synthesized at room temperature(about 25 degrees C) by mechanochemical reaction of alpha-Fe2O3 and ZnO powder under the effect of high energy ball milling. The prepared nanocrystallite was characterized by XRD, TEM, Mossbauer spectroscopy and IR spectrum, The results showed that the as-milled nanocrystalline zinc ferrite is non-normal spinel structure and show superparamagnetism, There are many defects in the as-milled nanocrystalline zinc ferrite.

[42] MECHANICALLY ALLOYED SN-FE(-C) POWDERS AS ANODE MATERIALS FOR LI-ION BATTERIES - I. THE SN2FE-C SYSTEM

Mao O. Dunlap RA. Dahn JR. - Journal of the Electrochemical Society. 146(2):405-413, 1999

We have prepared intermetallic phases and mixtures of such phases in the Sn-Fe-C Gibbs' triangle by mechanical alloying methods or by direct melting of elemental powders. This first paper in a three-part series focuses on the materials which fall on the two-phase line collecting Sn2Fe and C. Using in situ X-ray diffraction, Mossbauer spectroscopy, and electrochemical methods, we show that Sn2Fe reacts with Li in Li/Sn2Fe cells to form lithium-tin alloys and very small metallic iron grains. The experimental capacity for this reaction is about 800 mAh/g, as expected. During the first charge of such cells about 650 mAh/g of Li can be extracted up to 1.5 V vs. Li. The density of these materials is near 7 g/cm(3), so first-cycle volumetric capacities near 4500 Ah/L have been attained. It was our hope that the formed iron would act as an electrically conductive, inactive matrix to support the Li-Sn alloy grains and that good cycling behavior would result. However, the extended cycling life of these materials between 1.5 and 0.0 V is poor. On the other hand, reasonable cycle life is obtained if the cycling range is restricted to between 0.0 and 0.55 V, but in this case, the irreversible capacity is about 600 mAh/g and the reversible capacity only about 200 mAh/g. We show strategies to overcome these difficulties in the next papers in this series.

[41] MECHANICALLY ALLOYED SN-FE(-C) POWDERS AS ANODE MATERIALS FOR LI-ION BATTERIES - II. THE SNFE SYSTEM

Mao O. Dahn JR. - Journal of the Electrochemical Society. 146(2):414-422, 1999

Pk have prepared intermetailic phases and mixtures of such phases in the Sn-Fe-C Gibbs triangle by mechanical alloying methods or by direct melting. This second paper in a three-part series focuses on the intermetallic phases in the binary Sn-Fe system, Sn2Fe, SnFe, Sn2Fe3, and Sn3Fe5. Using in situ X-ray diffraction and electrochemical methods, we study the reversible reaction of Li with these materials. Li/Sn-Fe cells made from annealed powders have reversible capacities of 600, 50, 20, and 60 mAh/g, respectively for Sn2Fe, SnFe, Sn2Fe3, and Sn3Fe5. Li/Sn-Fe cells made from the same materials, but after high-impact ballmilling, show reversible capacities of 650, 320, 200, and 150 mAh/g. Specific capacities of 804, 676, 582, and 557 mAh/g are expected for Sn2Fe, SnFe, Sn2Fe3, and Sn3Fe5 if ail compounds react fully with Li tb form Li4.4Sn and Fe. In situ X-ray diffraction experiments on the ballmilled materials confirm the formation of Li4Sn during discharge but also show that in the cases of SnFe, Sn2Fe3, and Sn3Fe5 at least 50% of the starting phase remains unreacted. Structural considerations suggest that as the Fe:Sn ratio increases, Fe atoms may form a impenetrable "skin" on the surface of particles or grains, as Li reacts with the. Sn-Fe compounds. This skin prevents the full reaction of the intermetallic with Li, leading to an observed capacity which is lower than expected. High-impacting reduces particle and grain: size, so the effect of the skin is less than far the annealed powders and higher capacities are obtained. As the Fe content in the Sn-Fe intermetallics increases, the cycle life of the materials improves, presumably because there is more Fe per Sn and because the formed Fe and residual starting material act BS a "matrix" to hold the Sn and Li-Sn alloys together during cycling. We give an example of a material with a volumetric capacity of 1200 mAh/cm(3) showing stable cycling for over 80 cycles.

[40] MECHANICALLY ALLOYED SN-FE(-C) POWDERS AS ANODE MATERIALS FOR LI-ION BATTERIES - III. SN2FE : SNFE3C ACTIVE/INACTIVE COMPOSITES

Mao O. Dahn JR. - Journal of the Electrochemical Society. 146(2):423-427, 1999

We have prepared intermetallic phases and mixtures of such phases in the Sn-Fe-C Gibbs' triangle by mechanical alloying methods or by direct melting. This third paper in a three-part series focuses on composites of Sn2Fe and SnFe3C made by mechanical alloying of elemental powders. The Sn2Fe and SnFe3C grains which comprise the powder particles were about 10 nm in size. Seven samples of composition Sn2Fe, 25% (by weight) Sn2Fe/75% SnFe3C, 24% Sn2Fe/72% SnFe3C/4% C, 36% Sn2Fe/63% SnFe3C/1% C, 45% Sn2Fe/55% SnFe3C, 66% Sn2Fe/34% SnFe3C, and SnFe3C were studied. Using in situ X-ray diffraction and electrochemical methods, the reversible reaction of Li with these materials was studied. The Sn2Fe in these materials is an active phase, that is, it reacts completely to form Li4.4Sn and Fe, and the SnFe3C is an inactive phase, that is, it reacts with very little Li. Thus, since there is a two-phase tie line connecting an inactive and an active phase in the Sn-Fe-C ternary phase diagram, and the fact that mechanical alloying generally produces materials with very small grains, it is possible to produce composites with controlled amounts of active and inactive phases. The best material we have made gives a volumetric capacity of about 1600 mAh/cm(3), has an average voltage near 0.4 V vs. Li metal, and shows stable cycling for over 80 charge-discharge cycles. Materials like this may ultimately replace graphite as the anode of choice for the Li-ion battery.

[39] BALL MILLING CONDITIONS FOR THE AMORPHIZATION OF ZR50CU50

Ahn JH. Paek YK. - Journal of Materials Science Letters. 18(1):17-19, 1999

[38] A FINE COBALT-TOUGHENED AL2O3-TIC CERAMIC AND ITS WEAR RESISTANCE

Mao DS. Liu XH. Li J. Guo SY. Zhang XB. Mao ZY. - Journal of Materials Science. 33(23):5677-5682, 1998

Mechanical ball milling is the most common method for mixing ceramic powders with a ductile phase such as metal particles. In this paper, a new powder processing way is presented. Al2O3 and TiC powders are coated with a layer of metal cobalt using the chemical deposition process. The thickness of the metal cobalt film can be controlled by adjusting the deposition conditions. The Co-coated Al2O3 (Al2O3-Co) and TiC (Tic-Co) powders are mixed at the rate of 7:3 and hot-press sintered into a fine Al2O3-TiC-Co (ATG) ceramic. The main properties, erosion behaviour, abrasion behaviour, wear mechanism and wear resistance of Al2O3-TiC-Co and Al2O3-30 wt % TiC (AT(30)) ceramics are determined by transmission electron microscopy, scanning electron microscopy, energy dispersive X-ray spectroscopy, etc, it is shown that the ATC ceramic possesses improved mechanical properties. Because of the existence of metal cobalt in the grain boundaries, the bonding strength between grains is increased, and this prevents spalling of grains during wear. Experimentation indicates that ATC is more resistant to wear than Al2O3-TiC ceramic. The relationship between their mechanical properties and wear resistance is also discussed in this paper.

[37] MECHANICAL ALLOYING OF IMMISCIBLE PB-AL BINARY SYSTEM BY HIGH ENERGY BALL MILLING

Zhu M. Che XZ. Li ZX. Lai JKL. Qi M. - Journal of Materials Science. 33(24):5873-5881, 1998

In the present work, mechanical alloying has been applied to the Pb-Al immiscible binary system by using the method of high energy ball milling. The microstructural features of the milled powder, such as grain size, lattice constant and morphology of phases have been studied by X-ray diffraction, analytical transmission electron microscopy (TEM) and scanning electron microscopy (SEM). Besides, energy dispersive spectroscopy was used to analysis chemical composition of phases presented after milling. Differential Scanning Calorimetry measurement was also made on the milled Pb-Al powder. The results show that homogenous blending of Pb and Al can be easily achieved by high energy ball milling in spite of their mutual immiscibility and large difference in density. The obtained alloy exhibits nanocrystalline microstructure. Further more, the experiment result implies the formation of supersaturated solid solution in immiscible Pb-Al system by high energy ball milling.

[36] AMBIENT TEMPERATURE FORMATION OF (TA,NB)C AND (TA,NB)N

Welham NJ. - Journal of Materials Science. 34(1):21-27, 1999

A tantalum/niobium concentrate has been mechanically milled with magnesium and either graphite or nitrogen for 100 h. Directly after milling the formation of MgO was evident in both systems, a mixed metal carbide (Ta, Nb)C was also present in the carbon system. A cubic phase, close to that expected for the mixed metal nitride, was found in the powder milled under nitrogen. Annealing of the powders showed the reaction was incomplete with reduced oxide phases present. The carbide/nitride phases were readily separated from the MgO by acid leaching which left powders <5 mu m in size. The leaching preferentially dissolved the smaller, more highly strained crystallites in both cases.

[35] STRUCTURAL TRANSFORMATIONS OF BI2CUO4 INDUCED BY MECHANICAL DEFORMATION

Chen XL. Liang JK. Liu Y. Lan YC. Zhang YL. Ma Y. Che GC. Liu GD. Xing XY. Qiao XY. - Journal of Applied Physics. 85(6):3155-3158, 1999

Structural transformation of alpha-Bi2CuO4 (a = 8.4996 Angstrom, c = 5.8172 Angstrom, space group P4/ncc) during ball milling was investigated by powder x-ray diffraction and thermal analysis. It is shown that alpha-Bi2CuO4 first transforms into an amorphous phase; and then transforms into a new phase (designated by beta-Bi2CuO4) with milling time. The new phase appears to be isostructural to (La,Sr)(2)CuO4 and has a tetragonal cell with cell parameters a = 3.869 and c = 13.83 Angstrom. It is a metastable phase which can transform back into alpha-Bi2CuO4 at 650 degrees C. No superconductivity was observed above 5 K for both as-milled samples and oxygen-annealed beta-Bi2CuO4.

[34] CALCULATION OF THE PHYSICOCHEMICAL PARAMETERS OF MECHANOCHEMICAL REACTORS

Urakaev FK. Boldyrev VV. - Inorganic Materials. 35(2):189-196, 1999

Parameters of interaction between grinding media and the material being ground are calculated for various ball mills, a disintegrator, and other grinding machines. Based on a nonlinear elastoplastic model for collisions between solid particles, the average impact duration, force, geometry, normal and tangential velocities, and normal and tangential stresses were calculated. The results were used to determine the t-p-T conditions of mechanochemical processes in grinding machines-pressure and temperature pulses in the contact area of particles.

[33] MATRIX EFFECT IN THE SYNTHESIS OF THE HIGHLY DISPERSED COMPOSITE SKELETON ZIRCONIUM PHOSPHATES USING OF THE MECHANOCHEMICAL METHOD [RUSSIAN]

Pavlova SN. Sadykov VA. Zabolotnaya GV. Chaikina MV. Maksimovskaya RI. Tsybulya SV. Burgina EB. Zaikovskii VI. Litvak GS. Kuznetsova NN. Lunin VV. - Doklady Akademii Nauk. 364(2):210-212, 1999

[32] PROGRESS ON SUPERPLASTICITY AND SUPERPLASTIC FORMING IN TAIWAN DURING 1987-1997 [REVIEW]

Huang JC. Chuang TH. - Materials Chemistry & Physics. 57(3):195-206, 1999

This paper is to briefly outline the recent research and development activities in the held of superplasticity and SPF/DB applications among academic and industrial community in Taiwan. Academic research activities can be roughly divided into material development and SPF/DB experiments. The material development emphasizes the development of fine-grained materials, resulting in high-temperature superplastic 7075/7475 Al-Zn-Mg alloys and low-temperature superplastic 2090/8090 Al-Li alloys, as well as several high-strain-rate superplastic aluminum matrix composites. The thermomechanical treatments involved include (1) conventional rolling and reheat method, (2) equal channel angular extrusion, (3) reciprocal extrusion, (4) asymmetrical rolling, (5) wedge-shape forging, and (6) directional solidification plus extrusion. The SPF/DB places more weight on forming practices and applications. Titanium base alloys and stainless steel are of more interest. Major breakthrough includes the successful fabrication of high-pressure vessels, spherical coolant containers for infrared detectors, floating balls for level control in chemical industry, internal gas blow forming using inorganic powders, small-scaled SPF/DB straight- or arc-rib reinforced hollow structures, SPF/DB golf heads, and certain special assemblies for electronic products. Limited applications on production lines are undergoing, e.g., the front-head covers for missiles by Military Institute and turbine engine blades by Shan-Tung Aerospace Company. Efforts in applying to titanium golf heads have once been

popular, but become less intense due to the recent drop of sale price. The application in electronic industry seems to have promising potential. Finally, the production of extra fine-grained aluminum alloys has attracted the attention of local aluminum company recently.

[31] MECHANOCHEMICAL EFFECT ON MG-ALLOYS
Eliezer A. Abramov E. Gutman EM. - Journal of Materials Science Letters. 17(10):801-803, 1998

[30] SYNTHESIS OF LICOO2 BY MECHANICAL ALLOYING
You HW. Lee HY. Jang SW. Shin KC. Lee SM. Lee JK. Lee SJ. Baik HK. Rhee DS. - Journal of Materials Science Letters. 17(11):931-934, 1998

[29] PHASE TRANSFORMATIONS INDUCED IN MAGNETITE BY HIGH ENERGY BALL MILLING
Sorescu M. - Journal of Materials Science Letters. 17(13):1059-1061, 1998

[28] CHEMICAL REACTIONS BETWEEN VANADIUM OXIDES AND CARBON DURING HIGH ENERGY BALL MILLING
Zhang DL. Zhang YJ. - Journal of Materials Science Letters. 17(13):1113-1115, 1998

[27] FORMATION OF FETI HYDROGEN STORAGE ALLOYS BY BALL-MILLING
Sun L. Liu H. Bradhurst DH. Dou S. - Journal of Materials Science Letters. 17(21):1825-1830, 1998

[26] MG2NI ALLOY FOR METAL HYDRIDE ELECTRODES
Chen J. Bradhurst DH. Dou SX. Liu HK. - Journal of Materials Science. 33(19):4671-4675, 1998
A study was made of the effects of ball-milling Mg2Ni alloy with nickel powder, and chemically coating it with nickel on the alloy properties. Three types of alloys, nickel mixed, nickel ball-milled and nickel coated Mg2Ni alloy, were used as the active material of metal hydride electrodes. The ball-milling of the alloy with nickel powder results in an amorphous or nanocrystaline phase. Chemical coating of the alloy with nickel was carried out at 25 degrees C. The alloy particles were pulverised by the colliding process during the ball-milling and possibly by a hydrogen decrepitation mechanism during the coating process. Electrochemical measurements show that the electrode fabricated from the nickel mixed Mg2Ni alloy was very difficult to charge and discharge at room temperature, while the characteristics of the electrode prepared by nickel ball-milling or nickel coating were greatly improved because of the changed phase structure and surface behaviour.

[25] THERMODYNAMIC CALCULATION OF PHASE EQUILIBRIA IN THE TI-CO AND NI-SN SYSTEMS
Nash P. Choo H. Schwarz RB. - Journal of Materials Science. 33(20):4929-4936, 1998
A thermodynamic model for the titanium-cobalt system has been developed utilizing measured enthalpies of mixing of the liquid and evaluated phase-diagram data. The free energies of the liquid, bcc, fee, and hcp solid solutions, and TiCo, Ti2Co, TiCo2, and TiCo3 compounds were calculated for a temperature of 400 K. The model and measured heats of crystallization have been used to predict the free energy of the metastable amorphous phase at 400 K, needed for comparison with experimental results on the mechanical alloying of Ti and Co. The predicted glass-forming range for alloys prepared by mechanical alloying is from 10 to 81.5 at. % Co. We adopted a similar approach for modeling the Ni-Sn system to calculate the free energies of Ni3Sn, and Ni3Sn2, and the liquid (amorphous) and fee solid solutions in the nickel-rich region at 240 K. In this system the inclusion of the magnetic contribution to the free energy of the Ni-rich fee solid solution is important in interpreting the results of mechanical alloying. We propose a simple transformation of the free-energy curves, which assists in the graphical identification of the glass-forming ranges.

[24] INTERPRETATION OF MECHANOCHEMICAL PROPERTIES OF LIPID BILAYER VESICLES FROM THE EQUATION OF STATE OR PRESSURE-AREA MEASUREMENT OF THE MONOLAYER AT THE AIR-WATER OR OIL-WATER INTERFACE
Feng SS. - Langmuir. 15(4):998-1010, 1999
There are quite a few types of equation of state and abundant pi-a curves of various lipid monolayers at the air-water or the oil-water interface in the literature. However, it has been a problem to interpret mechanochemical properties of bilayer vesicles from the pi-a information of the monolayer. In fact, even the bilayer surface pressure has not yet been well characterized although the monolayer surface pressure has already been traditionally defined as the lowering in the surface tension from the clean interfacial tension due to the presence of the monolayer. The monolayer-bilayer correspondence problem, therefore, could not be well defined and completely solved despite its importance in practice to apply the monolayer pi-a data to elucidate bilayer vesicle properties. In the present analysis, we thus first define the bilayer leaflet pressure as the intrinsic pressure of the lipid layer-water substrate system. This intrinsic surface pressure should be the same function of the Lipid density and the temperature for both the monolayer at an interface and a leaflet of bilayer vesicles. Therefore, the difference between a leaflet of a bilayer and the monolayer at an interface is merely that the latter, but not the former, exhibits a microscopic interfacial tension between the air or the oil and the lipid layer. We show that the value of this intrinsic pressure agrees with that of the traditional monolayer pressure if the macroscopic and microscopic hydrophobic effect assumes the same magnitude. We conclude that the equilibrium pressure between the monolayer and bilayer vesicles is equal in magnitude to the microscopic interfacial tension between the water and the monolayer, which, in first approximation, is equal to the macroscopic oil-water interfacial tension, i.e., ca. 49 mN/m. This conclusion agrees with that briefly derived by pioneers (Gruen and Wolfe, 1982; Nagle, 1976, 1986; Jahnig, 1984). We further develop from mechanics and thermodynamics of membranes a procedure to obtain either analytically from a theoretical or empirical equation of state, or graphically from the pi-a curve of the monolayer at an interface, mechanochemical properties of this monolayer and bilayer vesicles. The method is exemplified for the monolayer and bilayer vesicles of dilauroyl phosphatidylethanolamine (DLPE).

[23] HARD MAGNETIC PROPERTIES OF SM3FE26.7VXN4 AND SM3FE26.7VXCY
Han XF. Zhang MC. Qiao Y. Yang FM. Yang CP. Liu GC. Wang YZ. Hu BP. - Journal of Magnetism & Magnetic Materials. 192(2):314-320, 1999

Sm3Fe26.7V2.3N4 nitrides and Sm3Fe26.7V2.3Cy carbides have been synthesized by gas-solid phase reaction. Their hard magnetic properties have been investigated by means of additional ball-milling at room temperature. The saturation magnetization of Sm3Fe26.7V2.3N4 almost decreases linearly with increasing ball-milling time t, but that of Sm3Fe26.7V2.3Cy has no obvious change when the ball-milling time increases from t = 1 to 28 h. As a preliminary result, the maximum remanence B-r of 0.94 and 0.88 T, the coercivity mu(0i)H(C) of 0.75 and 0.25 T, and the maximum energy product (BH) of 108.5 and 39.1 kJ/m(3) for their resin-bonded permanent magnets are achieved, respectively, by ball-milling at 293 K.

[22] INFLUENCE OF MILLING CONDITIONS ON MAGNETIC PROPERTIES OF ND(FE,MO)(12)N-X COMPOUNDS

Zeng Q. Xiao YF. Dong SZ. Liu XB. Qiu BQ. Zhang ZY. Wang R. - Journal of Magnetism & Magnetic Materials. 192(2):321-324, 1999

Ball milling conditions were examined for the preparation of fine Nd(Fe,Mo)(12)N-x particles. The milling process with high ratio of ball to powder produced Nd(Fe,Mo)(12)N-x particles with low iH(c) and 4 pi I-r. The decrease in 4 pi I-r and iH(c) was attributed to population of alpha-Fe and particle aggregates that were formed during the milling. The addition of process control agents (PCA, e.g. stearic acid) prevented aggregation in the ball milling, however, a large amount of alpha-Fe was precipitated during the recrystallization and an improvement of magnetic properties, as hoped for, did not occur.

[21] PECULIARITIES OF MECHANICALLY ACTIVATED SYNTHESIS OF HOMOLOGOUS BI2+XSR2CAN-1CUNO4+2N+D COMPOUNDS

Shlyakhtina AV. Kolbanev IV. Shcherbakova LG. - Chemical Physics Reports. 17(8):1463-1470, 1998

A (BiPb)(2)Sr2Ca2Cu3O10+d-2223(Pb) compound which has the highest temperature of transition to the superconducting state (T-c similar to 110 K) in the homologous series considered is synthesized employing mechanical activation of a starting oxide-nitrate mixture containing lead oxide. The synthesis process is multi-stage and involves Bi2Sr2CuO6-2201 and (BiPb)(2)(SrO8+d)-O-2-2212(Pb) structural homologs. Mechanical activation of the stating mixture is shown to favor formation predominantly of phase 2201(Pb) - the basic compound through which the end product, 2223(Pb) forms. The rate of 2212(Pb) and 2223(Pb) homologs reduces with increasing n, which apparently is associated with the kinetic hindrance of ordering the intercalation layers in multilayer structures. Contribution of the liquid phase accelerating this process increases with n. It is revealed that in the Bi2+xSr2Can-1CunO4+2n+d homologous series, as in similar HgCan-1Ba2CunO2n+4+d and Tl2Can-1Ba2CunO2n+4+d series, the high-temperature superconducting compounds with n = 2,3,4 contain defects which are fragments of the structural homologs with n = n-1 and n = n+1.

[20] STRUCTURE FORMATION IN POWDERED IRON UNDER A PULSED LOAD

Antsiferov VN. Bekker VY. Mazein SA. - Russian Metallurgy. (4):107-112, 1998

The structure and phase composition of powdered iron subjected to a pulsed load (explosive treatment) are investigated, The dependence of the volume fraction of gamma Fe on the load parameters is found by X-ray structural analysis. The phase transition alpha --> gamma is not due solely to thermal effects in the contact zone. The dislocation structure and its spatial order are investigated. On the basis of experimental data and solution of the Fokker-Planck equations, a law describing the substructure evolution as a function of the pulsed-load parameters is established. Shock experiments are proposed as model experiments for the more accurate study of processes occurring in mechanical alloying in high-energy grinding equipment.

[19] THE ROLE OF FE ON THE CRYSTALLISATION OF ALPHA-SI3N4 FROM AMORPHOUS SI-N FORMED BY ION IMPLANTATION

Li ZL. Wong-Leung J. Deenapanray PNK. Conway M. Chivers DJ. FitzGerald JD. Williams JS. - Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials & Atoms. 148(1-4):534-539, 1999

Ion implantation into Si has been used to produce near-surface. amorphous Si-N layers with the nitrogen content both below and exceeding Si3N4 stoichiometry. Iron has been introduced into some of these layers to study the effect of Fe on subsequent crystallisation to alpha-Si3N4. Rutherford backscattering and channeling, X-ray diffraction and cross-sectional transmission electron microscopy have been used to analyse these implanted samples before and after annealing to 1000 degrees C. These results provide considerable: insight into alpha-Si3N4 formed by another non-equilibrium mixing process, namely reactive ball milling or mechanochemistry.

[18] ANALYSIS OF STRAIN RATE DEPENDENCE OF TENSILE ELONGATION FOR A MECHANICAL MILLING AL-1.1MG-1.2CU ALLOY TESTED AT 748 K FROM A DISLOCATION DYNAMICS VIEWPOINT

Hasegawa T. Okazaki K. - Materials Science & Engineering A-Structural Materials Properties Microstructure & Processing. 260(1-2):294-300, 1999

Tensile deformation was carried out for a mechanically milled and thermo-mechanically treated Al-1.1Mg-1.2Cu (at.%) alloy at 748 K and three nominal strain rates of 10(-3,) 10 degrees, and 10(2) s(-1). Despite the prevailing belief that superplasticity occurs by grain boundary sliding which requires slow strain rates at high temperatures, the maximum elongation was observed at the intermediate strain rate of 10 degrees s(-1), neither at the lowest nor the highest strain rates. In order to explain this phenomenon, the true stress-true strain behaviors at these three nominal strain rates were analyzed from a viewpoint of dislocation dynamics by computer-simulation with four variables of the thermal stress component sigma*, dislocation immobilization rate U, re-mobilization probability of unlocked. immobile dislocations Omega and dislocation density at yielding rho(o). It can then be concluded that the large elongation (> 400% in nominal strain) at the intermediate strain rate is produced by a combination of a very large Omega and a moderate U, resulting in a large strain rate sensitivity nz value.

[17] SYNTHESIZING NANOCRYSTALLINE PB(ZN1/3NB2/3)O-3 POWDERS FROM MIXED OXIDES

Wang J. Wan DM. Xue JM. Ng WB. - Journal of the American Ceramic Society. 82(2):477-479, 1999

The attempt to synthesize a Pb(Zn1/3Nb2/3)O-3 (PZN) powder of perovskite structure via both traditional ceramic

and chemistry-based novel processing routes over the last three decades has failed. Difficult-to-synthesize nanocrystallite PZN powders have, for the first time, been successfully prepared via a mechanochemical reaction either among PbO, ZnO, and Nb2O5 or between PbO and pre-reacted ZnNb2O6 from ZnO and Nb2O5 for more than 15 h in a high-energy mechanochemical reaction chamber, The resulting PZN powders exhibit a well-established perovskite structure and their crystallite sizes are in the range of 10 to 15 nm, as has been indicated from the peak broadening of X-ray diffraction and direct observation using a high-resolution transmission electron microscope.

[16] NIOBIUM ALUMINIDE AS A SOURCE OF HIGH-CURRENT SUPERCONDUCTORS [REVIEW]
Glowacki BA. - Intermetallics. 7(2):117-140, 1999
The development of high-critical-current superconducting A15 conductors able to carry current in very high magnetic fields (25-30 T) is recognised as an enabling technology for the construction of second-generation NMR magnets operating at frequencies well above I GHz. This paper highlights the current status of development of the niobium-aluminide intermetallics with special attention to Nb3Al, and Nb-3(A(1-x),Ge-x). Discussion is focused on the materials science aspects of conductor manufacture, such as beta-phase (A15) formation, with particular emphasis on the maximisation of the superconducting parameters, such as critical current density, J(c), critical temperature, T-c, and upper critical field, H-c2 Many successful manufacturing techniques of the potential niobium-aluminide intermetallic superconducting conductors, such as solid-state processing, liquid-solid processing, rapid heating/cooling processes, are described, compared and assessed. Special emphasis has been laid on conditions under which the J(c)(B) peak effect occurs in some of the Nb3Al wires. The case is made that mechanical alloying during final wire preparation plays an important role in diminishing the peak effect, except in the case of A15 formation from a mixture of 'sigma-phase' and Nb. Further study of the influence of mechanical alloying on the maximisation of the critical current density at high magnetic fields is crucial to the understanding of the peak effect formation in tapes formed from 'sigma-phase'. Additionally, many aspects of conductor design requirements such as stress, strain, a.c. losses, thermal and electromagnetic stabilisation, are discussed with reference to literature sources.

[15] INTERACTION OF IRON POWDER WITH OXYGEN OF AIR UPON MECHANICAL ALLOYING [RUSSIAN]
Cherdyntsev VV. Kaloshkin SD. Tomilin IA. - Fizika Metallov i Metallovedenie. 86(6):84-89, 1998

[14] HIGH-SPEED TRIBOLOGICAL PROPERTIES OF SOME AL/SICP COMPOSITES: I. FRICTIONAL AND WEAR-RATE CHARACTERISTICS
Kwok JKM. Lim SC. - Composites Science & Technology. 59(1):55-63, 1999
The friction and wear behaviour of four Al/SiCp composites has been investigated over a wide range of sliding conditions by the use of a specially adapted high-speed tester of the pin-on-disk configuration. Two of the composites tested were fabricated in-house by a powder metallurgy route incorporating mechanical alloying; two commercially sourced composites were also tested far comparison. Generally, wear rate increased with increasing load, but it varied in a rather complex manner with speed depending on which regime the sliding condition fell into. Three regimes of tribological behaviour, demarcated by sliding speed, were observed for these composites. In Regime I, lower rates of wear are observed while in Regime II, catastrophic failures occur when a certain critical load is exceeded, resulting in the rapid adhesion of a large amount of specimen material to the counterface: it is no longer possible to continue with the test when this happens. In Regime III, extensive melting of the composites takes place, and under such a sliding condition, the size of reinforcement particles appears to have an important influence on the rate of wear of these composites.

[13] HIGH-SPEED TRIBOLOGICAL PROPERTIES OF SOME AL/SICP COMPOSITES: II. WEAR MECHANISMS
Kwok JKM. Lim SC. - Composites Science & Technology. 59(1):65-75, 1999
The high-speed frictional and wear-rate characteristics (up to 29 m s(-1)) of four Al/SiCp composites have been described earlier (Kwok JKM, Lim SC, High-speed tribological properties of some Al/SiCp composites: I. Frictional and wear-rate characteristics. Composite Science and Technology, 1999;59(1):55-63). This paper documents our investigation into the various mechanisms of wear which are observed to operate under this same range of sliding conditions when the same four composites, two fabricated inhouse by a powder metallurgy route incorporating mechanical alloying and two sourced commercially, were tested. Five dominant mechanisms have been found, viz (1) abrasive and delamination wear; (2) a combination of abrasion, delamination, adhesion and melting; (3) melt wear; (4) severe adhesion and (5) severe melting. The regions of dominance of the various mechanisms are also presented in terms of the applied load and sliding speed used. It is found that the size of the particulate SiC reinforcement phase controls the high-speed wear resistance of the composites tested; massive wear will occur if the particles are smaller than a threshold value. Al/SiCp composites with small SiC particles are therefore more suitable for lower-speed applications.

[12] BALL-MILLING-INDUCED POLYTYPIC TRANSFORMATION OF 6H-SIC -> 3C-SIC
Yang XY. Shi GY. Huang HL. Wu YK. - Science in China Series E-Technological Sciences. 42(1):54-59, 1999
The results of X-ray diffraction (XRD) and high resolution electron microscopy (HREM) show that ball milling at room temperature can induce the polytypic transformation of 6H-SiC-->3CSiC. HREM study reveals that a large number of partial dislocations which play an important role in the transformation can be introduced into SiC crystals during BM by the instant and repeated collisions between balls and powder. The phase transformation follows the route: 6H=(3(+),3(-))-->(4(+),2(-))-->(5(+),1(-))-->(6(+),0(-)).

[11] Novel materials synthesis by mechanical alloying/milling [Review]
Murty BS. Ranganathan S. - International Materials Reviews. 43(3):101-141, 1998
An account is given of the research that has been carried out on mechanical alloying/milling (MA/MM) during the past 25 years. Mechanical alloying, a high energy ball milling process, has established itself as a viable solid state processing route for the synthesis of a variety of equilibrium and non-equilibrium phases and phase mixtures. The process was initially invented for the production of oxide dispersion strengthened (ODS) Ni-base superalloys and later extended to other ODS alloys. The success of MA in producing ODS alloys with better high temperature capabilities in comparison with other processing routes is highlighted. Mechanical alloying has also been

successfully used for extending terminal solid solubilities in many commercially important metallic systems. Many high melting intermetallics that are difficult to prepare by conventional processing techniques could be easily synthesised with homogeneous structure and composition by MA. It has also, over the years, proved itself to be superior to rapid solidification processing as a non-equilibrium processing tool. The considerable literature on the synthesis of amorphous, quasicrystalline, and nanocrystalline materials by MA is critically reviewed. The possibility of achieving solid solubility in liquid immiscible systems has made MA a unique process. Reactive milling has opened new avenues for the solid state metallothermic reduction and for the synthesis of nanocrystalline intermetallics and intermetallic matrix composites. Despite numerous efforts, understanding of the process of MA, being far from equilibrium, is far from complete, leaving large scope for further research in this exciting field.

[10] A SIMPLE MODEL FOR THE CYCLIC AMORPHIZATION PHENOMENON

Sluiter M. Kawazoe Y. - Acta Materialia. 47(2):475-480, 1999

Recently, cyclic transformations in which amorphization and crystallization occur sequentially have been observed under continuous ball milling. It is shown that this phenomenon does not have obvious analogs with the periodic redox reactions or with diffusive-reactive phenomena known in chemistry. A model that takes into account the destabilizing effect of the defects created by ball milling is presented and compared with experimental observations.

[9] IN SITU TIME-RESOLVED DIFFRACTION COUPLED WITH A THERMAL IR CAMERA TO STUDY MECHANICALLY ACTIVATED SHS REACTION: CASE OF FE-AL BINARY SYSTEM

Charlot F. Bernard F. Gaffet E. Klein D. Niepce JC. - Acta Materialia. 47(2):619-629, 1999

Mechanically activated self-propagating high-temperature synthesis (MASHS) provides an attractive practical alternative to the conventional methods of producing intermetallic compounds, such as iron aluminides. This process involves mainly the combination of two steps; the first step, a mechanical activation, where pure elemental (Fe + Al) powders were co-milled inside a planetary mill, for a short time at given frequency and energy shacks and, the second step, a self-propagating high-temperature synthesis (SHS) reaction, which uses the exothermicity of the Fe + Al reaction. Once ignited with an external source, these reactions become self-sustained and propagate to completion within seconds. The combustion front directly leads to the formation of a nanometric Fe-Al intermetallic with a relative density of 70-80%. To understand this self-sustained reaction, an in situ study in real time was investigated on samples which differ by the shock power during milling and the compaction pressure (porosity). When the combustion front goes through the sample, the time-resolved X-ray diffraction experiment (TRXRD) using synchrotron radiation coupled with an infrared thermography allows the ill situ study of the phase formation and the temperature evolution during the MASHS process.

[8] INTERFACE INTERACTION AND INTER-OSMOSIS EFFECT OF FE-X(SIO2)(1-X) NANOCOMPOSITE MATERIALS ON MAGNETIC PROPERTIES

Xiong YH. Xiong CS. Li T. Li YZ. Wang DX. - Science in China, Series a (Mathematics, Physics, Astronomy). 42(2):162-170, 1999

Fe-x(SiO2)(1-x) nanocomposites prepared by using mechanical alloying method were reported. The microstructure character and magnetic properties of Fe-x(SiO2)(1-x) nanocomposite samples with different Fe content and different ball milling time were studied by using X-ray diffraction (XRD), transmission electron microscopy (TEM), Mossbauer spectroscopy, and Faraday magnetic balance in a wide temperature range. The results indicate that the microstructure and magnetic properties are closely related to ball milling time and Fe content. When Fe content is less than 20 wt%, the sample after 80-h ball milling has very complex microstructure. Small alpha-Fe grains and Fe cluster are implanted in SiO2 matrix. And there are not only isolated alpha-Fe granular and Fe cluster, but also nanometer scaled sandwich network-like structure. Fe-x(SiO2)(1-x) nanocomposite samples display a rich variety of physical and chemical properties as a result of their unique nanostructure, strong interface interaction and inter-osmosis effect in Fe-SiO2 boundaries, and the grain size effect.

[7] DEFECTS AND MAGNETISM IN CUBIC GDX2 LAVES PHASE COMPOUNDS

Modder IW. Bakker H. Zhou GF. - Physica B. 262(1-2):141-158, 1999

The relation between the structural and magnetic changes, induced by means of ball milling of GdX2 compounds that crystallise in the cubic Laves phase structure, is investigated, where X = Pt, Ir, Rh, Al and Mg. These live compounds all exhibit a ferromagnetic transition in the as-prepared, i.e. atomically ordered, state. An explanation for both the similarities and differences in magnetic behaviour as a result of structural changes due to milling is given. Only GdMg2 was found to disorder in anti-site disorder, whereas the others disordered in quadruple-defect disorder, which is a vacancy type of disorder similar to triple-defect disorder in B2 compounds. GdIr2 did in fact show both types of disorder. For longer periods of milling the formation of quadruple defects was taken over by the formation of pairs of anti-site defects. In ordered CdPt2, GdIr2, and GdRh2 the Gd-6s-like electrons are the main contributors to the indirect interaction between the Gd moments. This results in an increasing Curie temperature with decreasing lattice parameter and vice versa, a relation which even appears to be linear, probably because of the negligible influence of the non-magnetic element to the Gd-Gd interaction due to their d-electron character. Since the Curie temperature of GdMg2 was found to behave in a similar way in relation to the lattice parameter as the aforementioned compounds, it is concluded that the conduction electrons in GdMg2 must also mainly be of Gd-6s-like type. The electronic character of the conduction electrons of ordered GdAl2 are mainly of Gd-5d-like type, which results in a decreasing Curie temperature with decreasing lattice parameter. This relation was not so perfectly linear, probably because of the p-electron character of the Al atoms. The p electrons do apparently influence the Gd-Gd interaction, when substituted on the Gd sublattice. This even resulted in the introduction of antiferromagnetic interactions, possibly by means of a mechanism similar to superexchange, which finally led to GdAl2 becoming a spin glass. The freezing temperature of ball milled GdAl2 turns out to be proportional to the defect concentration. The substitution of Gd atoms on the non-magnetic sublattice in GdIr2 after long periods of milling and in GdMg2 (for all milling times), apparently causes these compounds to exhibit, at least, re-entrant spin-glass-like behaviour.

[6] RECYCLING OF MIXED AUTOMOTIVE PLASTICS

Deanin RD. Barry CM. Woramongconchai S. Parikh SC. - Macromolecular Symposia. 135:55-62, 1998
Mixed plastics from junked autos were homogenized by milling or extrusion, modified by addition of low-molecular-weight low-melt-viscosity polymers, and processed by compression or injection molding. Properties were comparable with high-density polyethylene and common building panel materials.

[5] AMORPHIZATION OF ERFE2 OBTAINED BY MILLING UNDER DIFFERENT ATMOSPHERES
Passamani EC. Larica C. Santos WR. Alves KMB. Biondo A. Nunes E. - Journal of Physics-Condensed Matter. 11(4):1147-1156, 1999
In the present work, high-energy milling under two different atmospheres was applied to the ErFe2 intermetallic compound and to the chemical elemental powders of Er and Fe with ErFe2 stoichiometric composition. Sample A is the compound milled under Ar, sample B the compound milled under N-2 and sample C the elemental powders milled under N-2 atmosphere. X-ray diffraction (XRD) and Mossbauer spectroscopy (MS) results of the samples A and B show a segregation process with increase of the milling time. Under N-2 atmosphere, the initial compound was nearly dissociated with 50 h of milling, while with Ar atmosphere the segregation process was completed with 100 h of milling. From the analysis of the XRD and MS results, it was possible to observe the appearance of other phases at intermediate milling times, in both samples A and B. One phase was associated with an amorphous ErFe2 alloy with a magnetic ordering temperature, obtained by AC magnetic susceptibility, at about 190 K, a second phase was attributed to nanocrystallites of alpha-Fe and a third one associated with an fee Er high-pressure phase stabilized by N atoms. In the case of sample B, for milling times longer than 400 h, XRD and MS results indicate the presence of an Fe-Er-N disordered alloy, with magnetic ordering temperature above room temperature. The XRD and MS results of sample C show the formation of an ErFe2 amorphous phase, with about 87% of MS relative area in this phase at 68 h of milling.

[4] MECHANICALLY INDUCED STRUCTURAL AND MAGNETIC PROPERTY CHANGES OF GDMG
Modder IW. Bakker H. - - Journal of Alloys & Compounds. 283(1-2):21-25, 1999
The structural and magnetic property changes of GdMg, induced by high-energy ball milling of the ordered compound, crystallising in the B2 structure, are studied by means of X-ray diffraction and various magnetic measurements. Pairs of anti-site defects are formed, giving rise to an increasing lattice parameter and a Curie temperature that decreases from a value of 120.4 K, in the as-prepared ordered compound, to a value of 86.6 K after 20 h of milling. The relation between the number of anti-site defects and the Curie temperature appears to be linear. After 20 h of milling, the obtained material shows spin glass-like behaviour, apparently due to a change of the ratio between ferromagnetic and antiferromagnetic interactions in favour of the antiferromagnetic interactions.

[3] SYNTHESIS OF SRFEO2.5 FROM MECHANICALLY ACTIVATED REACTANTS
Schmidt M. Kaczmarek WA. - Journal of Alloys & Compounds. 283(1-2):117-121, 1999
The influence of high-energy ball milling of reactants on a heat activated synthesis of SrFeO2.5 from hematite and strontium carbonate was investigated by X-ray diffraction and thermogravimetric analysis. According to our study the temperature and time required for the reaction can be significantly lowered by ball milling of reactants. A wet mechanical processing of the mixture is the fastest way to reduce the size of reactants' grains and therefore bring the temperature down. Apart from this, milling causes partial transformation of hematite to magnetite, which results in a smaller mass loss of the samples during calcination. However, SrFeO2.5 is synthesized together with some transient phases that finally vanish. This equilibration process is much faster in ball milled samples than in specimens prepared by the traditional ceramic method as a result of the higher homogeneity of the milled ones.

[2] THE USE OF METAL HYDRIDES IN POWDER BLENDING FOR THE PRODUCTION OF NDFEB-TYPE MAGNETS
Mottram RS. Kianvash A. Harris IR. - Journal of Alloys & Compounds. 283(1-2):282-288, 1999
A blending process involving neodymium hydride has been used to improve the sintering characteristics of a Nd13Fe80.5B6.5 alloy. An addition of 1 at% of neodymium hydride made by blending of the powders, consistent with a final composition of Nd14Fe79.6B6.4 was sufficient to reduce the required sintering temperature from 1130 to 1070 degrees C; with resultant improvement in the coercivity due to less grain growth and better grain isolation. The addition of dysprosium hydride to a Nd14Fe79B7 alloy by blending resulted in a further enhancement of the coercivity, a 2 at% addition yielding an approximate doubling in the value of intrinsic coercivity. Examination of the microstructure of dysprosium hydride blended magnets showed the dysprosium to be concentrated in the outer regions of the matrix grains, with the centres being essentially dysprosium free. Hydrogen has also been employed in improving the milling characteristics of the high melting point elements niobium and vanadium. Fine powders of niobium and vanadium hydride were prepared and were successfully blended into magnets with an even distribution throughout the microstructure. These studies have shown that powder blending of metal hydrides is an effective way of both promoting liquid-phase sintering in low rare earth composition magnets and of modifying the grain boundary phases and hence the magnetic properties.

[1] SYNTHESIS OF NA3ALH6 AND NA2LIALH6 BY MECHANICAL ALLOYING
Huot J. Boily S. Guther V. Schulz R. - Journal of Alloys & Compounds. 283(1-2):304-306, 1999
The direct synthesis of Na3AlH6 and Na2LiAlH6 by energetic mechanical alloying of stoichiometric mixtures of NaH, LM and NaAlH4 was investigated. Upon milling, the mixture 2NaH+NaAlH4 transforms into the high temperature phase beta-Na3AlH6. Similarly, the ball-milling of the mixture NaH+LiH+NaAlH4 produces Na2LiAlH6. The nature of phases was confirmed by X-ray diffraction and pressurized differential calorimetry.

Correspondants du Réseau Français de Mécanosynthèse
143 Laboratoires ou Groupes de Recherche

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

==========

Allemagne

- K.U. Kainer — **Institüt für Werkstoffkunde und Werstofftechnik "** Light Metals, Powder Metallurgy and Composites Group - Agricolastr. 6 - D 38678 - Clausthal Zellerfeld - Allemagne
- P. Reynders — **Merck -** Pigments Division) Bldg M18 - 64271 Darmstadt - Allemagne
- A Sagel — **Institut für Metallphysik und Technologie** - Technische Universität Berlin - Hardenbergstr. 36 - PN 2 - 3 - D - 10623 - Berlin - Allemagne
- M. Veith — **Universitat des Saarlandes**, Insitut für Anorganische Chemie - Postfach 15 11 50 - D 66041 - Saarbruchken - Allemagne

Angleterre

- B. Cantor — **University of Oxford** - Dpt of Materials - Parks Rd - Oxford OXI 3PH - UK
- B. Mohamed — Queen Mary & Westfield College - University of London - London - UK
- P.Schumacher — **University of Oxford** - Dpt of Materials - Parks Rd - Oxford OXI 3PH - UK
- P. Shashi — **De Montfort University -** Emerging Technologies Research Centre - SER Centre - Howthron Building - Gateway - Leiceter LE1 9BH - Royaume Uni

Argentine

- F.H. Sanchez (97) — **Dpto de Fisica** - Universidad Nacional de La Plata - CC67 - 1900 La Plata - Argentina
- L. Mendoza - Zelis (2000) — **Dpto de Fisica -** UNLP - CC 67 - 1900 La Plata - Argentine

Australie

- A. Calka(1997) — **Dep. Materials Engineering -** University of Wollongong - NSW 2522 - Australie
- S.J. Campbell — **School of Physics** - University College - The University of New South Wales - Australian Defence Force Academy - Canberra ACT 2600 - Australie.
- Y. Chen (1997) — **Dep.Elec. Mat. &Eng. -** RSPHYSSE - The Australian Nat. Univ. - Canberra ACT 0200 -
- J. Harrowfield (1999) — **Chemistry Department - Un. of Western Australia** - Nedlands - WA 6907 - Australie
- F.J. Lincoln — **Special Research Centre for Advanced Mineral and Materials Processing** - Univ. Western Autralia - Nedlands, Perth - Western Autralia 6907 - Australie
- J. Nikolov — CSIRO Minerals - Melbourne - Australie.
- W. Kaczmarek — **Dpt Appl. Mathematics** - Institute of Advanced Studies - Research School of Physical Sciences & Engineering - The Australian National University - Canberra ACT 0200 - Australie
- N. Welham — Applied Mathematics - Research School of Physical Sciences and Engineering Australian National University - ACT0200, Australie

Brésil

- W.J. Botta - Filho — **Dept. Eng. Mater.** -Univ. Federal Sao Carlos - CP 676 - 13565 - 090 - Sao Carlos Sp. - Brésil
- A. de Matos Dias — **Materials Science & Eng. Dpt** - Universidade Luterana do Brasil - Canoas - RS - Brésil
- R. S. de Figueiredo(97) — **Lab. Magn.& Mat. Magn.** - Dep. de Fisica - Cxp 6030 - 60.455 - 760 Fortaleza CE - Bresil
- G.F. Goya — Lab. Materiais. Magneticos - Instituto de Fisica - Univ. Sao Paulo - CP 66318 - Brésil

Canada

- J. Huot (1999) — **IREQ - Techn. des Matériaux -** 1800 Boul. L. Boulet - Varennes, Quebec, Canada J3X ISI
- J.-Y. Huot — **Noranda Technology Centre** - 240 Hymus Blvd - Pointe Claire - Que, H9R 1G5 - Canada
- L. Roué (1998) — **INRS - En. & Mat.-** 1650 Bd Lionel Boulet - Case Postale 1020 -Varennes (Québec) J3X 1S2 • A. Van Neste — Mines & Métallurgie - Un. de Laval - Pav. Pouliot, Ste - Foy Campus - GIK 7P4 - Quebec - Canada
- W.J. D. Shaw — Dept. Mech. Eng. - University Calgary - T2N 1N4 - Calgary Alberta - Canada

Chine

- J. Li — **Dept Materials Science** - Lanzhou University - Lanzhou 73000 - Chine
- K. Lu — State Key Lab for RSA - Institute of Metal Research - Chinese Academy of Sciences - Shenyang 110015 - P.R. Chine
- Yijun Sun — 865 Changning Road - Shangai Institute of Metallurgy - Chinese Academy of Sciences Shangai 200050 - Chine
- L. Wei — Institute of Metal Research - Chinese Academy of Sciences - Shenyang, 110015 - P.R. China
- N. Wu — Dept Mater. Sci. Eng. - Zhejiang University - Hangzhou - 310027 - Chine

Corée du Sud

- J.-H. Ahn — **Dept. Materials Engineering - Andong National University** 388 Songchon - Dong, Andong, Gyungbuk 760 749 - Corée du Sud
- S. H. Hong — **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) — **Department of Physics** - Faculty of Science, P.O. Box 162 - 10001 Zagreb - Croatie
- Andjelka. Tonejc — **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) — Research Institute for Solid State Physics - 1525 Budapest - P.O. Box 49 - Hongrie
- I. Dekany — Attila Jozsef University - Dept of Coloid Chemistry - Aradi Vt 1 - H 6720 Szeged - Hongrie
- L.K. Varga — Research Institure 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
- K.B.R. Varma — Materials Research Center - Indian Institute of Science - Bangalore - 560012 - Inde

Israel

- M.P. Dariel (1998) — **Dept. Materials Engineering** - Ben Gurion University of the Negev - Beer Sheva - Israel
- N. Frage — **Dept. Materials Engineering** - Ben Gurion University of the Negev - Beer Sheva - Israel
- A. Gedanken — **Dpt of Chemistry** - Bar - Ilan University - Ramat - Gan; Israel 52900
- E. Gutmanas — **Technion** - Israel

Italie

- D. Basset (1999) — M.B.N. srl - Via Roma - 4 - I31020 - San Vendemiano (TV) Italie
- S. Enzo — **INFM & Dipartimento di Chimica** - Univ. Sassari - Via Vienna 2 - 07100 Sassari - Italie
- F. Carli — Vectorpharma SpA, Via del Follatoio 12, 34100 Trieste - Italie
- M. Magini (1997) — **ENEA** - Dipart INNOVAZIONE - C.R. Casaccia - Via Anguillarese, 302 - I00060 Rome - Italie
- F. Mantovani — Vectorpharma SpA, Via del Follatoio 12, 34100 Trieste - Italie
- P. Pierrat* — Via Filiasi, 190 - 35128 - Padova - Italie

Japon

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

Pologne

- T. Janta — **Technical University of Wroclaw** - Inst. of Electric Machines & Drive - Wybrzeze Wyspianskiego 27 - Wroclaw 50 - 370 - Pologne
- D. Oleszak — **Dept Mater. Sci.& Eng.** - Warsaw Univ. Techn. - Nabutta 85 - 02 - 524 - Pologne
- B. Weglinski — **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** - Faculdada 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 — **Inst. Sol. State Chem.**- Russian Acad Sci. - Kutaleladze, 18 - Novosibirsk - 630128 Russia
- R.Z. Valiev — **Ufa State Aviation Technical University** - Inst. of Physics of Advanced Materials - 12 K. Marks Str., UFA 450000 - Russie
- A.N. Strelestskii — **Inst. Chem. Phys.** - RAS, Dept Kinetics & Catalysis - Kosygina Str. 4 - Moscou - Russie
- A. Y. Yermakov — **Applied Magnetism Lab**. - InstituteMetal Physics - 18 S. Kovalevskaya St. - GSP - 170 - Ekateringurg - 620219 - Russie
- A.Y. Zubarev — USU - Russie

Singapour

- Lu Li — Dpt Mechanical and Production Engineering - The National University of Singapore - 10 Kent Ridge Cresent - Singapore - 119260 - Singapour
- J. Wang — Department Materials Science - Faculty of Science - National University of Singapore Singapore 119260

Slovaquie

- P. Balaz — Institute of Geotechnics - Watsonova 45 - 04353 Kosice - Slovaquie
- K. Kristiakova — Institute of Physics - Dubravska Cesta 9 - SK - 842 28 Bratislava - Slovaquie

Suéde

- L.B. Kiss — Nanomaterials and Noise Projects - Dpt Materials Science - The Angstrom Lab. Uppsala Univ. P.O. Box 534 - Uppsala, SE - 75121 - Suède
- A. Salwen — **Swedish Inst. Metals Res.** - Drottning Kristinas V. 48 - Stockholm S 114 - 28 - Suède
- S.J. Savage — **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 — **Dpt Materials Science and Engineering** - 1304 W. Green St. - Urbana IL 61801 - USA
- Xiabao Fan — **Nanomaterials Research Corporation**-2620 Trade Centre Avenue-Longmont CO80503-USA
- E. Y. Ivanov — **Tosoh SMD Inc.**, 3600 Gantz Road, Grove City - Ohio 43123 USA
- J.N. Newkirk — **Dept Metallurgical Eng.** - Univ. Missouri - Rolla - Rolla MO 65409 USA.
- R.E. Riman — **Dept Ceramic and Materials Engineering** - Rutgers University - P.O. Box 909 - Piscataway, NJ 08855 - 0909 USA
- L. Takacs (98) — Univ. Maryland - Baltimore Country - Dpt Physics - 1000 Hilltop Circle - USA

Viet Nam

- Pham Khac Hung — ITIMS - 1 Round, Dai Co Viet, Hanoi Viet Nam
- To Ba Van — Institute of Materials Science - HCMC Branch, NCST 01 Mac Dinh Chi, Dist 1 - Hochiminh City - Vietnam

France

- H. Ageorges* — **Lab. Thermodyn. Trait. Poudres** - Fac. Sciences - 2 Bd Lavoisier - F49045 - Angers Cedex
- M. Arigon (1998) — **Roucaire Instruments Scientifiques** - 2, Avenue du Pacifique, Les Ulis - BP 78 F91943 Courtaboeuf Cedex
- L. Aymard — **LCRS** - 33 Rue de Saint Leu - F80039 - Amiens Cedex
- D. Aymes (1997) — **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-R Authelin (1999) — Rhône Poulenc Rorer - Responsable du Service Qualite Phyique (Dpt Procédés) Centre de Recherches de Vitry Alfortville - 94400 Vitry / Seine Cedex
- M.-I. Baraton (1997) — **LMCTS ESA 6015** - Fac des Sciences 123 Avenue A. Thomas - F87060 Limoges Cedex
- J.-F. Baumard* — **ENSCI** - 47 Avenue A. Thomas - F87065 Limoges Cedex
- S. Begin - Colin (1998) — **LSG2M- CNRS**- Ecole des Mines - F54042 - Nancy Cedex
- K. Ben Djemiaa (1999) — Rhône Poulenc Rorer - Responsable du Service Qualite Phyique (Dpt Procédés) Centre de Recherches de Vitry Alfortville - 94400 Vitry / Seine Cedex
- F. Bernard * — **LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins" Faculté des Sciences de Mirande - BP 138 - F21004 - Dijon Cedex
- Ph. Blanchard (1997) — **Saft Recherche** - Route de Nozay - F91460 Marcoussis
- J.L. Bobet (1998) — ICMCB - Bordeaux

A. Briantais (1997) — **CREPI - PSA** - Direction des Methodes et Equipements Industriels - Batiment Forge Route de Chalampé - BP 1403 - F68071 Mulhouse Cedex

- J.-M. Castillo (1997) — **Faure Equipements** - BP 52 - 21 Rue Santos Dumont - F87002 Limoges Cedex
- L. Chaffron * — **CEN Saclay** - DTA / CEREM / DECM / SRMP - F91191 - Gif/Yvette Cdx
- F. Charlot* — **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. Chartier (1997) — **Lab. Métal. Phys.**- URA CNRS 131 - Bd 3, Téléport 2 - BP 179 -F86960 - Futuroscope Cedex
- B. Cheng (1997) — **LRRS - CNRS** UMR 5613 - Equipe "Matériaux à Grains Fins" - Université de Bourgogne UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex
- G. Cornella* — **Schneider Electric** - Dir. Rech. Matériaux/A3 - Rue Henri Tarze - F38050 - Grenoble Cedex 9
- D. Cracco (1998) — CNRS - Lab de Chimie Métallurgique des Terres Rares - 2 - 8 Rue H. Dunant - F94320 Thiais
- A. Demortier (1998) — LASIR - HEI (CNRS UPR 2631) - 13 Rue de Toul - F59046 Lille Cedex
- C. Djega - Mariadassou* — **Lab. de Structure des Mat. Métal.** - Bât. 413 - 414 - Un. Paris Sud - F91405 - Orsay Cedex
- J. Dodds (1997) — **Ecole des Mines d'Albi** - Campus Jarlard - F81013 Albi Cedex 04
- E. Duverger (1997) — **LMIT** - IUT Belfort - BP 527 - 90016 - Belfort Cedex

• O. El Kedim (1997)	**Laboratoire de ThermoMécanique** - IPSé - F90010 - Belfort Cedex
• J.-P. Eymery (1998)	**Lab. Métal. Phys.** - URA CNRS 131 - Bd 3, Téléport 2 - BP 179-F86960 - Futuroscope Cedex
• N. Feninèche (1997)	**Laboratoire de ThermoMécanique** - IPSé - F90010 - Belfort Cedex
• A. Fnidiki (1998)	**Lab. Magn. & Appl.** -URA 808 -Univ. Rouen-UFR Sci.& Tech-F76821 - Mt St Aignan Cdx3
• J. Foct (1997)	**Lab. de Métallurgie Physique** Univ. Lille 1 - Bat C6 - 2ème Et. -F59655 - Villenuve 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. Girot (1998)	**LSG2M- CNRS**- Ecole des Mines - F54042 - Nancy Cedex
• C. Goujon (1998)	Ecole des Mines - St Etienne - France
• F. Goutenoire (1998) Cdx	Lab. Fluorures - UPRES CNRS A 6010 - Fac des Sciences - Av. O. Messiaen - 72985-Le Mans
• 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. Lacorre1998) Cdx	Lab. Fluorures - UPRES CNRS A 6010 - Fac des Sciences - Av. O. Messiaen - 72985-Le Mans
• 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 Unversité d' 80039 Amiens - France
S. Lenard	Univ. Metz - 57 Metz
• C Levaillant (1998)	**Centre Matériaux** - Ecole Mines d'Albi Carmaux - Rue de la Poudriére-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 Phyique (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. Nakhl (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) Cdx	Lab. Fluorures - UPRES CNRS A 6010 - Fac des Sciences - Av. O. Messiaen - 72985-Le Mans

• 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*	**Eq. Physique de l'Etat Condensé** - Univ.Maine - Fac Sciences - F72017 - Le Mans Cedex
• H. Souma (1997)	**LRRS** - CNRS UMR 5613 - Equipe "Matériaux à Grains Fins" - Université de Bourgogne UFR Sciences et Techniques - 9 Avenue Alain Savary - BP400 - F21011 Dijon Cedex
• N. Spath (1997)	**Comptoir Lyon - Alemand - Louyot**- CR - 8, Rue Portefoin - F75003 - Paris
M. Stamm (1997)	**C2M Technology** - C.E.E.I Zone Industrielle Ste Agathe - Rue Lavoisier- F57192 - Florange
• J. Steinmetz (1998)	**Labo de Chimie Minérale** - Univ. de Nancy I - B.P. 239 - F54406 - Vandoeuvre Cedex
• H. Szwarc (1999)	Lab. Chimie Phys. Mat. Am. - CNRS URAD1104 - Bat. 490 - Univ. Paris Sud - Orsay F91405
• J. Teillet (1998)	**Lab. Magn. & Appl.** -URA 808 -Univ. Rouen-UFR Sci.& Tech-F76821 - Mt St Aignan Cdx3
• F. Thévenot (1999)	**ENSMSE** - Lab. Céramiques Spéciales - 158 Cours Fauriel - F42023 - Saint Etienne Cedex
• I. Tkatchenko (1997)	**CNRS/ Institut Recherche Catalyse** - 2 Avenue A. Einstein -F69626 Villeurbanne Cedex
• A. Tousimi (1999)	LTPCM INPG / CNRS - 1130 Rue de la Piscine - Domaine Univ.- BP 75 38042 St Martin d'Hères
A. Venot (1997)	**SINTERTECH** - Centre R & D- Voie des Collines - F38800 Le Pont de Claix - France
• R. Welter (1997)	**Labo de Chimie Minérale** - Univ. de Nancy I - B.P. 239 - F54406 - Vandoeuvre Cedex
• R. Yavari	**INPG - LTPCM - CNRS URA 29** - ENSEEG, 1130 Rue de la Piscine Domaine Univ. - BP 75 - F38042 - Saint Martin d'Hères - France
• M. Zeghmati (98)	**LMIT** - IUT Belfort - BP 527 - F90016 - Belfort Cedex
• M. Zouggar (1998)	**Lab. Métal. Phys.**- UMR 6630 - Bd 3, Téléport 2 - BP 179 -F86960 - Futuroscope Cedex
• C. Zinc * Cdx	Thann & Mulhouse, Usine de Thann-Serv. PCA-95 Rue du Gal de Gaulle BP 34- 68801 Thann

Corresp. : Eric.Gaffet@utbm.fr

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** / Subcription 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 - F'rance

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 reportee 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 (-Fe2O3) – Maghemite (- Fe2O3) 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_3Si**
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, Montpelier 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 Cristallochimie - 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. Zougggar 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 $NbAl_3$ 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

Corresp. : Eric.Gaffet@utbm.fr

Propositions d'affiches (Posters)

1) Co - broyage de poudres pharmaceutiques
M. Baron – (École 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. Nakhl, 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_2Cu_3Ox 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 controlée (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_2 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 $FeSi_2$ et $MoSi_2$ 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_3Ti bars obtained by extrusion of MA powders
S. Lehnard, K. Helming, C.P. Chang, F. Wagner, T. Grosdidier
(LETAM - URA CNRS 2090 - Mets // 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 Al33Ni16Zr51 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 69Ga et 71Ga dans GaF3 après broyage haute énergie.
B. Bureau, H Guerault, G. Silly, J.Y. Buzare, J.M. Greneche (LPEC UPRES-A 6087Université du Maine)

17) Mécanosynthèse de matériaux thermoélectriques à base de tellure de plomb.
N. Bouad, R.M. Marin-Ayral, J.C. Tedenac (LPMC, Montpelier 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 wiredrawn composites.
R. Taillard, A. Ustinov, A. Belhadj (UMR8517 CNRS Villeneuve d'Ascq, Inst. For Metals Physics Kiev)

Corresp. : Eric.Gaffet@utbm.fr