

# RESEAU FRANÇAIS DE MECANOSYNTHESE

## Lettre N° 62

-----  
**Mai 2000**

**176(+1) Groupes de Recherche**  
**(dont 103 (+1) à l'étranger / 35 Pays)**

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

### **International Editorial LRFM Committee**

**P. Balaz** - Institute of Geotechnics - Slovak Academy of Science - Slovakia  
**G. Le Caër** - LSG2M - CNRS - France  
**A. Calka** - Dpt Materials Engineering - Univ. Wollongong - Australia  
**E. Gaffet** (Coord.) - Nanomaterials Research Group - CNRS - France  
**S.H. Hong** - Dpt Materials Science and Engineering - KAIST - Korea  
**E. Ivanov** - Tosoh - USA  
**M. Senna** - Faculty of Science and Technology - Japan  
**L. Takacs** - Dpt Physics - Univ. Maryland - USA

=====

### **SOMMAIRE**

**Nouvelle Adhésion**  
**Full Congress Annouements**  
**Congress List (related to Nanomaterials)**  
**Cooperation (PhD, Post Doc, International Relationships)**  
**Books (related to Nanomaterials)**  
**Bibliography**

=====

**Nouvelle Adhésion**  
**M. Cheney** - Dept Envir. Sciences - The State University of New Jersey - USA

=====

**Le site web du RFM est :**  
**<http://www.bls.fr/amatech>**  
Rubrique Pages Sciences et Techniques pour l'Ingénieur (Rubrique Sciences)  
vous y trouverez les anciennes lettres du RFM (accessible par Adobe Acrobat)  
les statuts du RFM ainsi que les annonces concernant les JRFM'99 et quelques éléments mis à jour régulièrement  
concernant les derniers résultats dans ce domaine.

=====

\*\*\*\*\*

## JRFM'2000

5èmes Journées du Réseau Français de Mécanosynthèse  
23 et 24 Mai 2000 - Bordeaux, ICMCB

Website : <http://www.jrfm2000.u-bordeaux.fr>

\*\*\*\*\*

### BULLETTIN d'INSCRIPTION JRFM'2000

**Fiche d'Inscription** : (à renvoyer à Jean-Louis BOBET le plus tôt possible, avant le 31.01.2000)

Nom : Prénom :  
Téléphone : Fax : E-mail :  
Adresse de Facturation :

Pour les laboratoires propres ou associés au CNRS, indiquer le code et l'adresse complète de l'Unité. Une facture sera établie directement à leur rencontre.

Pour les agent CNRS merci d'**indiquer votre indice majoré** :  
(nécessaire pour obtenir un discount pour les déjeuners!)

**Frais d'inscription** : (comprenant†: recueil des résumés, 2 déjeuners, 1 dîner)

Déjeuner du 23 mai oui / non  
Banquet du 23 mai soir† oui / non (Prière d'entourer les réponses)  
Déjeuner du 24 mai† oui / non

#### Tarifs

Etudiant(e)s en thèse : 100 FF Autres participant(e)s : 400 FF  
Pour les fournisseurs et autres exposants, contacter directement E. Gaffet

#### Mode de paiement :

Dès réception du bulletin d'inscription dûment complété par vos soins (ou d'un bon de commande de votre organisme), une facture sera établie pour paiement : aucun règlement n'est à effectuer à l'inscription.

**Rappel** : le CNRS gérant ce colloque, il est fortement conseillé de privilégier le paiement par virement administratif du CNRS.

(-----)

Fiche d'inscription et résumés à retourner le plus tôt possible et avant le 31/01/2000 :  
Jean-Louis BOBET (Journées RFM2000)  
CNRS - Institut de Chimie de la Matière Condensée de Bordeaux  
Av du Dr A. Schweitzer - 33608 Pessac Cedex  
(Tel : 05.56.84.26.53 - fax : 05.56.84.24.80, E-mail : bobet@icmcb.u-bordeaux.fr)

#### Date limite d'Envoi des Résumés : 30 Avril 2000

Publications : 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

#### IMPORTANT :

Les frais d'inscription ne comportent pas l'adhésion au RFM au titre de l'année 2000.

Pour participer aux JRFM2000, il est impératif d'envoyer votre cotisation de 100 FRF à l'ordre du RFM.  
(Pour tout renseignements complémentaires sur cette adhésion contacter E. Gaffet).

#### Comité d'organisation

Jean-Louis Bobet et toute l'équipe "Détermination structurale et matériaux magnétiques"  
CNRS - ICMCB (UPR 9048 CNRS - Université Bordeaux1)

Av du Dr A. Schweitzer, 33608 Pessac Cedex.

Tel : 05.56.84.26.53 - Fax : 05.56.84.24.80 E-mail : bobet@icmcb.u-bordeaux.fr

&

Eric Gaffet

Président du Réseau Français de Mécanosynthèse

Groupe "Nanomatériaux"

Université de Technologie de Belfort - Montbéliard -UTBM

Site de SÈvenans - 90100 Belfort Cedex.

Tél : 03 84 58 31 02 - Fax : 03 84 58 30 27

**E-mail : Eric.Gaffet@utbm.fr**

## Journées d'Automne 2000

Maison de la Chimie à Paris  
du 17 au 19 octobre 2000

Les Journées d'Automne 2000 de la Société Française de Métallurgie et de Matériaux se tiendront à la Maison de la Chimie à Paris, du 17 au 19 octobre 2000. Le programme scientifique est composé de six symposiums, dont deux européens, avec des conférences sollicitées, des conférences proposées et des sessions posters.

Les thèmes des symposiums sont les suivants :

- Symposium 1 : *Microstructure Control by Thermomechanical Treatments*
- Symposium 2 : Présent et futur des matériaux frittés
- Symposium 3 : *Matériaux et environnement*
- Symposium 4 : *Composite Materials : microstructural aspects*
- Symposium 5 : *Ingénierie simultanée et matériaux*
- Symposium 6 : *Oxydation et corrosion à haute température*

### SYMPOSIUM 2 : PRÉSENT ET FUTUR DES MATÉRIAUX FRITTÉS

Ce symposium a pour but de faire le point sur l'état actuel et les potentialités futures (à 5 ans) des matériaux frittés et des disciplines permettant leur mise en forme. L'éclairage doit porter sur les matériaux, leurs compositions, leurs propriétés (physiques, mécaniques, chimiques, ...) et leurs applications. Les procédés d'élaboration (préparation des poudres, frittage ...) ont bien évidemment leur importance, mais ne devront être commentés que brièvement.

Les disciplines et classes de matériaux proposés sont :

- Aciers, aciers réfractaires, aciers spéciaux.
- Métaux et alliages légers.
- Métaux et alliages réfractaires.
- Intermétalliques.
- Matériaux pour l'électrotechnique et l'électronique.
- Matériaux magnétiques.
- Matériaux à gradients.
- Matériaux pour applications tribologiques.
- Nanomatériaux (métaux et céramiques).
- Céramiques avancées.
- Biocéramiques.
- Compression des poudres : théories, technologies, modélisations.
- Frittage : théories, technologies, modélisations.

Des propositions d'exposés oraux et affichés sont sollicitées pour illustrer les travaux menés selon les thèmes donnés plus haut.

### Liste des conférences sollicitées

- G. RAISSON (Techphy, Imphy) : *Relations microstructure-process en métallurgie des poudres des superalliages.*
- G. NICOLAS (Cime-Bocuze, St Pierre en Faucilly) : *Les métaux réfractaires Mo, W, Nb, Ta et leurs alliages. Propriétés, domaines d'emploi et évolution.*
- F. NARDOU (Université de Limoges) : *Les intermétalliques et leurs potentialités.*
- J.M. HAUSSONNE (Ecole Ingénieurs, Cherbourg) : *Applications des céramiques à l'électronique et à l'électrotechnique.*
- Ph. TENAUD (Ugimag, St Pierre d'Allevard) : *New hard ferrite permanent magnets based on La-Co doped M phase.*
- S. RIMLINGER (Cermep, Grenoble) : *Les carbures cémentés : l'offre et la demande.*
- E. GAFFET (CNRS / Univ. Techn. Belfort, Montbeliard) : *Nanomatériaux : bilans et perspectives.*
- D. URFFER (CREE St Gobain, Cavailon) : *Développement des céramiques structurales.*
- G. FANTOZZI (INSA, Villeurbanne) : *Vers une nouvelle génération de biocéramiques.*
- P. DOREMUS (ENSP Grenoble) : *Compression des poudres en matrice : caractérisation du procédé et modélisation.*
- J.M. MISSIAEN (ENSEE Grenoble) : *Modélisation du frittage : progrès récents et perspectives.*

### **Posters**

Une session particulière sera consacrée à l'étude des posters pour compléter cette série de conférences.

### Renseignements

- Si vous désirez présenter une communication, informez le plus rapidement possible la SF2M. Les instructions utiles vous seront adressées en retour.
- Si vous désirez le programme complet de ces journées, demandez-le à la :

**SF2M/JA 2000 - Les Fontenelles - 1 rue de Craïova - 92024 Nanterre Cedex**

**Tél. : 01 41 02 03 90 - Fax : 01 41 02 03 88 -**

**Mél : [sfmm@wanadoo.fr](mailto:sfmm@wanadoo.fr)**

**Site : [www.sf2m.asso.fr](http://www.sf2m.asso.fr)**

## 7th International Symposium on Agglomeration

29, 30, 31 May 2001  
Albi - France

624 th event of the E.F.C.E.

### First circular and call for papers

Joint event of the  
**European Federation of Chemical Engineering**  
**Society of Powder Technology of Japan**  
**Particle Technology Forum of the A.I.Ch.E.**

in honour of the late Professor Genji Jimbo

Ecole des Mines d'Albi-Carmaux - Laboratoire de Génie Chimique –CNRS  
INP-ENSIGC PROGEP

### The Symposium is supported by :

Société Française de Génie des Procédés (SFGP), Centre Nationale de la Recherche Scientifique, (CNRS), Société de Chimie Industrielle (SCI).

### The Symposium is organized by :

Ecole des Mines d'Albi-Carmaux (EMAC), Laboratoire de Génie Chimique,(LGC), Ecole Nationale Supérieure d'Ingenieurs de Génie Chimique of the Institut National Polytechnique de Toulouse (INP-ENSIGC), Association pour la Promotion du Génie des Procédés (PROGEP)

### Organizing Committee

Chairman : Professor J.A.Dodds, Albi  
Co-Chairman : Professor Mehrgi Hemati, Toulouse  
Secretariat : Florence Foucaud, PROGEP Toulouse  
Prof. Jacques Fages, Albi  
Dr Christine Frances, Toulouse  
M. François Frisou, Rhodia, Paris  
Dr Laurence Galet, Albi  
Professor Pierre Guigon, UTC, Compiègne  
Dr Nadine Le Bolay, Toulouse  
Dr Driss Oulahna, Albi

### Scientific Committee

European Federation of Chemical Engineering Working party on Agglomeration

Prof.Karl Sommer (University of Munich)  
Prof.Hans Leuenberger, (Faculty of Pharmacy Basel)  
Prof.Brian Scarlett, (Technical University of Delft)  
David W.York (Procter and Gamble GB)

### Society of Powder Technology of Japan

Prof. Yoshiaki Kawashima (Gifu Pharmaceutical University)  
Prof. Fumio Saito (Tohoku University),  
Prof. Masayuki Horio (Tokyo University of Agriculture and Technology)  
Prof. Ko Higashitani (Kyoto University)

### Particle Technology Forum A.I.Ch.E,

Dr Karl Jacob, (The Dow Chemicals Company)  
Dr George Klinzing (University of Pittsburg)  
Dr Gabriel Tardos (City University of New York – CUNY)  
Dr Bryan Ennis (E&G Associates)

### International Scientific Committee

Dr P.Bach (DK)	Prof J.D.Litster (Australia)
Prof. H.G.Kristensen (DK),	Dr-Ing G.Meesters (NL)
Dr R.Davies (USA)	Dr T.Nagy (H)
Dr B.Dencs, (H)	Dr-Ing J.Novosad (CZ),
Prof Sunil de Silva (N)	Dr M.Peciar (Slovakia)
L.J.Ford (GB)	Dr W.Pietch (USA)
Prof K.Heiskanen (Fin)	Prof K.Sastry (USA)
Prof Jasso (Slovakia)	Prof J.Seville (GB)

**Objectives of the Symposium**

The International Symposium on Agglomeration was organized for the first time in 1962 and the previous Symposium was held in Nagoya in 1993

The purpose of the symposium is to provide a forum for the presentation and discussion of recent developments in the science and technology of agglomeration processes.

This will cover all types of operation for size enlargement and making structured particles : wet and dry granulation, compaction, briquetage, spray drying, prilling, encapsulation, coating, instantizing, pelletisation, extrusion, etc.....

Papers are welcome from academic institutions and all industries involved in these processes : Chemical, Pharmaceutical, Cosmetics, Iron and Steel, Coal and Coke, Detergents, Food industry, Mineral Processing, .....

An exhibition of equipment, instruments, books, software and process developments will be held in conjunction with the Symposium. Please contact the organizers for further information,

**Some of the areas to be covered in the symposium will be**

- ? Industrial agglomeration technology. and circuit design.
- ? Process design, modelling, simulation and control.
- ? Particle design, tailored particles, instantizing, smart particles,
- ? End use properties, dispersion, delayed release, targeting, characterisation methods,
- ? Fundamentals and micro-processes including particle-particle and particle-binder interaction, granule structure,
- ? Industrial case studies in pharmaceuticals, energy, foods, agricultural chemicals, detergents, .....

The 7th International Symposium on Agglomeration will be held at the Ecole des Mines d'Albi-Carmaux, newly opened in 1995. This is located in the South of France in the historic city of Albi. The International Airport of Toulouse-Blagnac offers convenient access and a shuttle service will be provided for the 45 minute transit to Albi.

**Sessions**

Papers will be presented in plenary or a maximum of three parallel sessions and as posters.

All papers will be included in the conference proceedings available at registration.

After the conference the papers will be reviewed and published as a special edition of the journal **Powder Technology**.

A certain amount of financial assistance will be available for students and workers coming from non-European countries

**Requirements for abstracts**

Persons wishing to submit a paper should provide three copies of an abstract of at least 300 words giving a complete as possible a description of the work including the objectives, the claims made and the expected results. These abstract should be submitted with the attached application form by mail, fax or electronic mail to the Symposium secretariat :

**before 31 July 2000**

**PROGEP-ENSIGC - Agglomeration 2001, - Florence Foucaud,**

**18 Chemin de la Loge, 31078 Toulouse, France**

**Tel : (33) 562 252 380 - Fax : (33) 562 252 318**

**e-mail : [progep@ensigct.fr](mailto:progep@ensigct.fr) - [http://www.univ-inpt.fr/\\*agglom](http://www.univ-inpt.fr/*agglom) or <http://www.enstimac.fr/>**

**Timetable**

31 July 2000	Deadline for receipt of abstracts.
October 2000	Notification to authors and instructions for preparation of camera ready manuscript.
15 February 2001	Deadline for receipt of full camera ready manuscripts

**Reply Form**

**O** Please send me further information on the 7th International Symposium on Agglomeration in Albi France 29-31 May 2001

Prof, Dr, Mr, Ms \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**O** I will submit a 300 word abstract before the 31 July 2000 with the provisional title \_\_\_\_\_

PROGEP-ENSIGC,  
7th International Symposium on Agglomeration,  
18 Chemin de la Loge,  
31078 Toulouse,  
France.

Tel : (33) 562 252 380  
Fax : (33) 562 252 318

e-mail     [progep@ensigct.fr](mailto:progep@ensigct.fr)     [dodds@enstimac.fr](mailto:dodds@enstimac.fr)

=====

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

=====

-----

**JRFM'2000**

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

&

Website : <http://www.jrfm2000.u-bordeaux.fr>

-----

**III European Conference on Fluidization**

29 - 31 Mai 2000 - Toulouse - France  
E-Mail : [Progep@ensigct.fr](mailto:Progep@ensigct.fr)

-----

**PM2 TEC2000**

**2000 International Conference on Powder Metallurgy & Particulate Materials**

31 Mai - 3 Juin 2000 - New York - USA

Contact : MPIF

-----

**4th EUROMECH**

26 - 30 Juin 2000 - Metz - France

E-Mail : [euromech@lpmm.univ-metz.fr](mailto:euromech@lpmm.univ-metz.fr)

WebSite : <http://www.lpmm.univ-metz.fr/euromech>

-----

**ISMANAM 2000**

International Symposium on Metastable Mechanically Alloyed and Nanocrystalline Materials

9 - 14 Juillet 2000 - St Catherines College - Oxford UK

E-Mail : [ismanam2000@materials.ox.ac.uk](mailto:ismanam2000@materials.ox.ac.uk)

website : <http://www.materials.ox.ac.uk/OCAMAC/ISMANAM/ismanam2000.html>

-----

**NCM8**

**8th International Conference on the Structure of  
Non - Crystalline Solid**

6 - 11 Aout 2000

Website : <http://www.sgt.org>

-----

**XIVth International Symposium on the Reactivity of Solids**

Budapest, Hungary through 27-31 August 2000

<http://www.jate.u-szeged.hu/~isrs14>

-----

**Solid State Chemistry 2000**

Prague, Czech Republic, September 3 - 8,2000

and

**3rd INCOME**

**International Conference on Mechanochemistry and Mechanical Alloying**

Prague, Czech Republic, September 4 - 8,2000

Organised by the Institute of Inorganic Chemistry (UACH), Czech Republic

WebSite : <http://www.iic.cas.cz/INCOME.htm>

-----

**Inorganic Materials Conference**

University of California Santa Barbara, USA

13 - 16 September 2000 <http://www.elsevier.com/locate/im2000>

NOUVEAU

-----

**Congrès de la Société Française de Chimie**

Univ. Rennes I

18 - 22 Septembre 2000

website : <http://www.sfc.fr>

-----

**MATERIALS WEEK**

**International Congress on Advanced Materials,  
their Processes and Applications**

25 - 28 September 2000

ICM – International Congress Centre Munich in Conjunction with the Exhibition Materialica

website : [www.materialsweek.org](http://www.materialsweek.org)

-----

**J2IM 2000**

**“Joints Intergranulaires et Interphases**

**dans les Matériaux“**  
Fontainebleau - EDF (Site des Renardières)  
4 - 6 Octobre 2000  
<http://perso.club-internet.fr/adjr/j2im.html>

NOUVEAU

-----  
**Journées d'Automne 2000 / SF2M**

Maison de la Chimie à Paris  
du 17 au 19 octobre 2000  
e\_mail : [sfm@wanadoo.fr](mailto:sfm@wanadoo.fr)  
Website : [www.sf2m.asso.fr](http://www.sf2m.asso.fr)

-----  
**Nanomatériaux :**  
**Vers les Applications Industrielles**  
**Nanomaterials :**  
**Towards Engineering Applications**

Colloque : France - Etats Unis - Canada  
22 - 25 Octobre 2000 - Montréal, Canada  
Contacts : [Champion@glvt-cnrs.fr](mailto:Champion@glvt-cnrs.fr) et/ou [Eric.Gaffet@utbm.fr](mailto:Eric.Gaffet@utbm.fr)

-----  
**PM 2000**

**Powder Metallurgy World**  
**Congress & Exhibition**  
12 - 16 Novembre 2000 Kyoto - Japon  
Contact : Fax : 81 - 3 - 3423 - 1600

-----  
**The 1st International Conference on Advanced Materials Processing**  
**Rotorua, New Zealand, 19-23 November 2000.**

Secretary, ICAMP 2000,  
Department of Materials and Process Engineering The University of Waikato  
Private Bag 3105, Hamilton, New Zealand  
Fax: 64-7-838 4835, e-mail: [d.zhang@waikato.ac.nz](mailto:d.zhang@waikato.ac.nz)  
Or visit the conference web site:  
<http://mape.waikato.ac.nz/conferences/amp.htm>

-----  
**"Scattering Studies of Mesoscopic Scale Structure and Dynamics in Soft Matter"**

Messina Italy  
22th to 25th of November 2000  
(for details see LRFM60)

-----  
**2000 MRS Fall Meeting**

27 Nov - 1 Dec. 2000  
Boston - Massachusetts - USA  
(for details see LRFM60)

-----  
**Science et Technologie des Poudres**

NOUVEAU

Nancy - France  
3 - 5 Avril 2001  
website : <http://www.inpl-nancy.fr/stpoudres3.html>  
e-Mail : [stpoudres@inpl-nancy.fr](mailto:stpoudres@inpl-nancy.fr)

-----  
**PM2 TEC2001**

**2001 International Conference on Powder Metallurgy**  
**& Particulate Materials**  
13 - 17 May 2001 - New Orleans - USA  
Contact : MPIF

NOUVEAU

-----  
**7th International Symposium on**  
**Agglomeration**

29, 30, 31 May 2001  
Albi - France  
Website : <http://www.univ-inpt.fr/~agglom>  
or <http://www.enstimac.fr>

\*\*\*\*\*  
**SOUTENANCE DE THESE**  
\*\*\*\*\*

**J. Joardar**

**"Synthesis of nanocrystalline aluminides in Al - Ni - Fe system  
by Mechanical Alloying"**

Avril 2000

Thesis Supervisor : B.S. Murty et S.K. Pabi (IIT, Kharagpur)

Thesis Examiners : C.C Koch (North Carolina State University) , P. Ramakrishnan (IIT, Bombay)

**Christine Barbeau**

(Laboratoire de Métallurgie Physique - Futuroscope)

**Sructure dans les matériaux élaborés sous HIP : cas des alliages à base tungtène par frittage  
et du carbure de titane par combustion auto-propagée**

13 mars 2000

**Thèse de Doctorat de l'Université de Poitiers**

**JURY:** A. TRAVERSE, Directeur de Recherche, LURE Orsay, Rapporteur - F. NARDOU, Professeur, Université de Limoges, Rapporteur, D. VREL, Chargé de Recherche, Université de Villetaneuse - Examineur, M.F. BEAUFORT - Chargé de Recherche CNRS, LMP Poitiers - Examineur, M. GROSBRAS - Chargé de Recherche CNRS, LMP Poitiers, Examineur - J. MIMAULT, Professeur, Université de Poitiers, Examineur et Directeur de Thèse

**Hugues GUÉRAULT**

**PROPRIÉTÉS STRUCTURALES ET MAGNÉTIQUES DE POUDRES DE FLUORURES  
NANOSTRUCTURÉES MF<sub>3</sub> (M=Fe, Ga)  
OBTENUES PAR BROUAGE MÉCANIQUE**

28 Janvier 2000

**THÈSE DE DOCTORAT** - Université du Maine - **Physique des Matériaux et des Surfaces**

**Jury :** Gérard Le CAER, Directeur de Recherche, Ecole des Mines - Nancy (Rapporteur), Marc NOGUES, Chargé de Recherche, Université de Versailles (Rapporteur), Jean-François BÉRAR, Ingénieur de Recherche, CNRS - Grenoble, Frédéric BERNARD, Maître de Conférence, Université de Bourgogne - Dijon, Jean-Yves BUZARÉ, Professeur, Université du Maine - Le Mans, Marc LEBLANC, Professeur, Université du Maine - Le Mans, Jean-Marc GRENÈCHE, Directeur de Recherche, Université du Maine (Directeur de thèse)

**Cyril Lenain**

**APPLICATION DE LA MECANOCHIMIE A LA PREPARATION D'ALLIAGES HYDRURABLES  
NANOCRISTALLINS AB<sub>5</sub>, MG-NI, AB<sub>2</sub> (M) ET DE COMPOSITES M-C, M-Cu : ETUDE DE LEURS  
PROPRIETES ELECTROCHIMIQUES.**

**THESE DE DOCTORAT** - Specialite: sciences des materiaux presentee a l'Universite de Picardie Jules Verne

**Jury :** M. le Prof. J. Etourneau (Universite Bordeaux) M. D. Fruchart (DR, Lab. Cristallographie, Grenoble) Mme A. Percheron - Guegan (DR, LCMTR, Thiais) M. le Prof. L. Schlapbach (Universite de Fribourg) M. le Prof. J.-M. Tarascon (Universite de Picardie) M. L. Aymard (Universite de Picardie)

**F.Charlot**

**Etude et compréhension des réactions auto-entretenues activées mécaniquement. Elaboration  
du composé FeAl nanostructuré.**

6 Déc. 1999 - Université de Technologie de Belfort - Montbéliard

Nanomatériaux : Elaboration et Transitions de Phases Hors Equilibre, UPR 806 CNRS, UTBM - Sévenans.

Matériaux à Grains Fins, LRSS UMR 5613 CNRS-Université de Bourgogne.

**Jury (Provisoire) :** G. Bertrand, G.LeCaer (Rapp.) , F.Thévenot (Rapp.) , F.Bernard (Co - Dir.), E.Gaffet (Co - Dir.), J.C.Gachon, M.Bessière, M.Gailhanou

**Frédéric BERNARD**

25 Novembre 1999 - Amphi de l'ESIREM - Dijon

**De l'introduction de " mécanique " dans l'élaboration de la poudre au massif nanométrique vers la maîtrise des  
propriétés thermomécaniques.**

**Jury :** D.LOUER, Directeur de Recherches CNRS (Université de Rennes II) rapporteur H. VAN DAMME, Professeur (Université d'Orléans) rapporteur J.C. TEDENAC, Professeur (Université de Montpellier II) Rapporteur J. FOCT, Professeur (Université de Lille) G. LE CAER , Directeur de recherches CNRS (Ecole des Mines, Nancy) G. BERTRAND, Professeur (Université de Bourgogne) A. NONAT, Directeur de Recherches CNRS (Université de Bourgogne) J.C. NIEPCE, Professeur (Université de Bourgogne)

**Frédérique PERROT-SIPPLE**

17 Novembre 1999 - Université de Bourgogne - Dijon

**Maitrise de la taille de nanograins d'oxydes de structure perovskite  
pour applications électrocéramiques:**

**- Synthèse par chimie douce,- Broyage par attrition.**

**Jury :** M. J.-M. HAUSSONNE Professeur, Ecole d'Ingénieurs de Cherbourg M. A. ROUSSET Professeur, Université

de Toulouse M BEAUGER Alain Ingénieur de Recherche et Développement TPC Saint Apollinaire M. BERTRAND Gilles Professeur, Université de Bourgogne M. CHARTIER Thierry Chargé de Recherche, ENSCI de Limoges M. HUGENTOBLE Denis Directeur Stratégie et Développement ligne céramique, TPC Saint Apollinaire M. MUTIN Jean-Claude Directeur de Recherche, Université de Bourgogne Mme RIEUX Nadine Ingénieur de Recherche Alstom-PERT, Massy **Directeurs de thèse:** M. D. AYMES Maître de Conférences, Université de Bourgogne M. P. PERRIAT Professeur, INSA de Lyon

-----  
**H. SOUHA**

Thèse de Doctorat d'Etat Marocaine  
Faculté des Sciences Dahr El Mehraz Fes.

**Elaboration par recuit et par réaction de combustion du composé  $Cu_3Si$  à partir d'un mélange de poudres activées mécaniquement. Réactivité du composé  $Cu_3Si$  vis à vis du chlorure cuivreux.**

**Jury :** B. Gillot, G. Bertrand, F. Bernard (Co - Dir.), E. Gaffet (Co - Dir.)

-----  
**O. Held**

**"Etude des réactions de combustions solide-solide ou solide liquide auto-entretenues pour différents intermétalliques du système Al-Ni-Ti.**

**Elaboration de ces mêmes intermétalliques par broyage mécanique et étude de leur cinétique de cristallisation**  
Nancy, Faculté des Sciences, le 5/11/99.

**Jury :** J. L. Jorda, J. M. Moreau, P. Satre, J. C. Gachon, F. A. Kuhnast, F. Bernard, J. F. Bézar, M. Bessière.

-----  
**D. Cracco**

**"Recherche de Nouveaux Alliages Hydrurables de Forte Capacité Massique Utilisable comme Matériaux d'Électrode Négative d'Accumulateur Ni - MH"**

CNRS - Thiais - France - 25 Juin 1999

**Jury :** B. Darriet, L. Schlapbach, B. Knosp, R. Portier, A. Percheron - Guégan

-----  
**A. Gentil - Sagot**

**Amélioration de la tenue au fluage d'un alliage d'argent (AIC) par introduction d'une dispersion d'oxydes.**

**Elaboration par Métallurgie des Poudres  
Ecole des Mines - Paris - 17 Juin 1999**

**Jury :** M. Grosbras, L. Charrin, S. Kleine, D. Havart, J. - L. Strudel, Y. Bienvenu

\*\*\*\*\*  
**Cooperative Research on Related Areas**  
\*\*\*\*\*

**COREE du SUD (19/01/2000)**

From Professor Soon H. Hong  
Dept. of Materials Science and Engineering - Korea Advanced Institute of Science and Technology  
373-1 Kusung-dong, Yusung-gu - Taejon, 305-701, Korea  
E-mail : HYPERLINK mailto:shhong@sorak.kaist.ac.kr / shhong@sorak.kaist.ac.kr  
Fax. : 82-42-869-3310 - Tel. : 82-42-869-3327

We are currently working on the mechanical alloying processes and the characterization of mechanical & thermal properties of nanocrystalline materials and composite materials, such as SiC/Al, WC/Co and W/Cu for structural or thermal management applications. We are very pleased to discuss for international cooperative research on related topics with Members of Mechanosynthese Group.

\*\*\*\*\*  
**Ph D Position and Post Doc Position  
Requests - Proposals**

**FRANCE (14 / 02 / 2000)**

**Ph D Thesis Proposal**

A partir de septembre 2000 (Bourse du Ministère)

**"Obtention par mécanosynthèse de mélanges composites à base de magnésium ayant des propriétés d'hydruration optimisées. Caractérisation de leurs propriétés structurales et physiques.**

En résumé, le sujet proposé portera sur les deux points suivants :

- 1 - Etude de mélanges composites Mg (ou Mg<sub>2</sub>Ni) + intermétalliques élaborés par mécanosynthèse (structure, composition chimique, capacités d'absorption d'hydrogène, morphologie, surface, granulométrie, ? ) ;
- 2 - Réalisation d'électrodes négatives à partir de ces mélanges et études électrochimiques.

Les techniques utilisées au cours de ce travail seront\* :

Préparation : - Broyeur planétaire - Four à lévitation - Four à arc - Banc d'hydruration (construction de courbe PCT)

Caractérisation : - Diffraction des rayons X sur poudres - Microsonde électronique - Microscopie électronique ( à balayage et en transmission) - Mesures de surfaces spécifiques (BET) - Granulométrie (diffraction Laser - "Mesures" électrochimiques - Mesures calorimétriques XPS, EPMA, ...

\* ceci est une liste non exhaustive des différentes techniques que le candidat devra utilisé

**Contact :**

**Jean-Louis BOBET**

Associate professor - Institut de Chimie de la Matière Condensée de Bordeaux Avenue du Dr A. Schweitzer  
33608 Pessac Cedex FRANCE

Tel : 33-(0)5-56-84-26-53 Fax : 33-(0)5-56-84-24-80 e mail : bobet@icmcb.u-bordeaux.fr

\*\*\*\*\*

**USA (8 / 02 / 2000)**

Rutgers University is seeking a **postdoctoral associate** with demonstrated expertise in powder synthesis and processing (forming and sintering methods) to work on research focused on textured ceramic ferroelectric materials. The candidate must be able to work as part of a multidisciplinary team involving industry and academia focused on making transducer and actuator materials. The candidate should demonstrate the ability to work independently, publish in archival journals and present their work in a public forum. The candidate should send a curriculum vitae, three representative publications (preferably with the candidate as a first author) and the names, addresses, email and phone numbers of three references that can comment on the candidate's capabilities. The position is available immediately at a salary of \$32,000 with health benefits included. The position is available immediately. Placement is preferred prior to August with priority given to a qualified candidate with earlier availability.

**Interested candidates should send correspondence** to: Professor Richard E. Riman, Rutgers University, Department of Ceramic and Materials Engineering, 607 Taylor Road, Piscataway, NJ 08854-8065, riman@alumina.rutgers.edu / 732-445-4946 / 732-445-6264

\*\*\*\*\*

**COREE du SUD (10 / 01 / 2000)**

From Professor Soon H. Hong  
Dept. of Materials Science and Engineering - Korea Advanced Institute of Science and Technology  
373-1 Kusung-dong, Yusung-gu - Taejon, 305-701, Korea  
E-mail : HYPERLINK mailto:shhong@sorak.kaist.ac.kr / shhong@sorak.kaist.ac.kr  
Fax. : 82-42-869-3310 - Tel. : 82-42-869-3327

The Composite Materials Laboratory at Korea Advanced Institute of Science and Technology is looking for a postdoctoral position. The postdoctoral contract will be one year on the field of modeling and simulation of mechanical & thermal properties of composite materials or on the field of fabrication process of nano-composite materials. Applicant should be within three years of receipt of Ph.D. degree on related field. For more information, please contact :

**ISRAEL (13 / 10 / 1999)**

**\*\*\* Postdoctoral Position Available for a Ph.D Physicist (13th October 1999)**

The High-Pressure (HP) group of the School of Physics & Astronomy at Tel Aviv University has a one year position available. This position could be extended to two years.

The HP group is known worldwide as one of the leading groups in experimental HP physics and is on the frontier of HP and diamond-anvil-cells based methodology. The main methods used are:

Mössbauer spectroscopy

X-ray diffraction with synchrotron radiation (ESRF, Grenoble) resistivity

Applicants must be between the final stage of dissertation and within three years of receipt of Ph.D diploma.

For more information, please contact:

Dr. Moshe P. Pasternak

School of Physics and Astronomy

Tel Aviv University - 69978 Tel Aviv, ISRAEL - email: hh136@ccsg.tau.ac.il

### **FRANCE (2/07/99)**

Joindre Pascal Viel , tél 01 69 08 41 47 CEA SRSIM Bt 461, 91191 Gif sur yvette

Proposition de post doc qui débiterait idéalement en septembre 99. Le financement du post doc est acquis (1 an) Le lieu de travail est le centre de Saclay (DSM/DRECAM/SRSIM) Le sujet concerne une étude très appliquée sur la dépollution des eaux de rejets industriels : Mise au point et étude d'un procédé d'élimination des métaux lourds basé sur la fabrication d'un filtre actif (complexation-décomplexation) utilisant la modification de surfaces métalliques par des films polymères électrogressés en couches minces.

Conditions: avoir sa thèse depuis moins d'un an, ne pas avoir été salarié depuis sauf pour un an de postdoc à l'étranger et avoir moins de 30 ans

## Bibliographie Récente

### Livres ou "Special Issues"

#### NOUVEAU (3/02/2000)

Two new books on mechanical alloying are now available from Cambridge International Science Publishing (infos fournies par Anne Porter - Publishing Manager - Cambridge International Science Publishing  
<http://www.demon.co.uk/cambsci/homepage.htm>)

#### 1. MECHANICAL ALLOYING - FUNDAMENTALS AND APPLICATIONS

<http://www.demon.co.uk/cambsci/book52.htm> Contents

Introduction (history, benefits of mechanical alloying); Mechanical alloying (alloying mills, mills in practice, improved mills, the process, parameters);

Variations of mechanical alloying (reaction milling, cryomilling, repeated rolling, double mechanical alloying, repeated forging); Process control agents in mechanical alloying; Mechanical alloying mechanisms (ductile-ductile system, ductile-brittle system, brittle-brittle system, metastable phase formation, amorphisation, nanocrystallization, extension of solid solubility, activation of solid state chemical interaction);

Energy transfer and energy maps;

Consolidation of mechanically alloyed powders (consolidation techniques, thermomechanical treatment); Mechanical properties of mechanically alloyed materials (tensile properties, fracture, creep, stress corrosion cracking susceptibility);

Modelling mechanical alloying (mechanistic models, deformation, coalescence and fragmentation, evolution of particle size, milling time, powder heating, powder cooling, atomistic model, thermodynamic and kinetic model)

Joining of mechanically alloyed materials; Rapid solidification and mechanical alloying; Applications (nickel-based superalloys, Al-based materials, supersaturated solutions, magnetic materials, mechanically alloyed powders for spray coatings, superplasticity, tribological materials, composites, amorphous solids, nanocrystalline materials, solid-state chemical reactions, etc). ISBN 1898326568, 160 pages 234?156 mm, cased, £45.00, 1999

#### DISPERSION STRENGTHENED ALUMINIUM PREPARED BY MECHANICAL ALLOYING, by M Besterici

<http://www.demon.co.uk/cambsci/book51.htm> 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 - ISBN 189832655X, 90 pages, 234?156 mm, soft laminated cover, £25.00, 1999

#### "Mechanical Alloying : Fundamentals and Applications"

Prof. P.R. Soni (1999) - Cambridge International Science Publishing

web site : <http://www.demon.co.uk/cambsci/book52.htm>

#### "Non Equilibrium Processing of Materials"

R.W. Cahn - Elsevier Science - Volume 2 in the Pergamon Materials Series

A large number of technical papers have been published in reviews, monographs and conference proceedings, but have almost always been devoted to a single processing technique. This book, however, covers all the non equilibrium processing methods and their effects in a single volume.

web site : [www.elsevier.nl/locate/isbn/0080426972](http://www.elsevier.nl/locate/isbn/0080426972)

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

A. Inoue

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

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

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

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

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

Michal Besterčí, 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-Al<sub>4</sub>C<sub>3</sub> 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)

Index : ISBN 189832655X, 80 pages, 234x156 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 à lancé d'ambitieux programmes de R & D puisque le MITI a consacré aux nanomatériaux près de 200 millions de dollars pour la période 1990 - 2000 et que la Science & Technology Foundation a investi presque la même somme pour co - financer des projets de laboratoires publics et privés. Les Etats Unis puis les pays européens ont investi plus tardivement mais déjà ont obtenu des résultats prometteurs (.....) Certaines applications existent déjà au niveau international, quelque 400 sociétés se partagent aujourd'hui un marché voisin de 1 milliard de dollars mais qui devrait tripler, voire quintupler à l'horizon 2001.(.....)

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

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

-----  
**CHEMISTRY FOR SUSTAINABLE DEVELOPMENT**

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

Proceedings of 2d International Conference on Mechanochemistry

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

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

-----  
**Mechanochemistry of Materials**  
**Cambridge International Science Publishing**

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

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

-----  
**BIBLIOGRAPHY ON MECHANICAL ALLOYING AND MILLING**

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

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

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

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

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

## PERIODIQUES

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

### [30] INFLUENCE OF THE ROTATION SPEED OF THE BALL MILL FOR GRAIN COMPOSITION

A Heim, T Olejnik - PHYSICO-CHEMICAL PROBLEMS OF MINERAL PROCESSING - XXXVI SYMPOSIUM, 1999, 1999, pp 63-74 - XXXVITH SYMPOSIUM ON PHYSICO-CHEMICAL PROBLEMS OF MINERAL PROCESSING; WROCLAW, POLAND. , 1999

This paper contains an analysis of the results of researching disintegration of ground materials in the ball mill. Disintegration was conducted in a laboratory mill (6 dm<sup>3</sup> capacity and 200 mm of inner diameter). Milling tests have been carried out for few types of ground materials which differed in Mohs' hardness. Materials were screened during the milling process and results were used to describe kinetics of the milling process according to the moment theory. The moment theory could describe in time the grain-size distribution of the ground material using ordinary and central moments and their functions: the concentration coefficient and the distribution asymmetry coefficient. Described is the influence of the rotating speed of the ball mill for grain composition.

### [29] A NOVEL DRY PULVERIZER FOR LOW COST PRODUCTION OF POWDERS

Spitas V. Makris P. Founti M. - Particulate Science & Technology. 17(3):217-228, 1999

The paper presents the principles of a prototype dry pulverizer particularly suited for industrial applications together with performance tests demonstrating its advantages. The pulverizer offers considerable advantages when compared to commonly used comminution processes, especially in the fine and superfine milling of minerals. The originality of the pulverizer lies mainly in that it allows the variation of the ratio of the shear to the compression forces acting on a particle during its pulverization. The ratio is adjusted to the mechanical requirements of the material to be pulverized. Instead of a single roller or balls, the pulverizer employs several annular rings, thus allowing better grinding of the finer fractions of the original material. The adjustment of the operational conditions to the mechanical properties of the material to be pulverized and the increase of the "active" surface of the pulverizer are examined in terms of ratio of the work done by normal forces to the total work (due to normal and shear forces). Accession Number 288WM-0011

### [28] MECHANOCHEMICAL SYNTHESIS OF THE HIGH LITHIUM ION CONDUCTIVE AMORPHOUS MATERIALS IN THE SYSTEMS Li<sub>2</sub>S-SiS<sub>2</sub> AND Li<sub>2</sub>S-SiS<sub>2</sub>-Li<sub>4</sub>SiO<sub>4</sub>

Morimoto H. Yamashita H. Tatsumisago M. Minami T. - Nippon Seramikkusu Kyokai Gakujutsu Ronbunshi-Journal of the Ceramic Society of Japan. 108(2):128-131, 2000

Amorphous materials in the system xLi<sub>2</sub>S .(100-x)SiS<sub>2</sub>, where x ranged from 50 to 70 mol%, and (100-y) (0.6Li<sub>2</sub>S . 0.4SiS<sub>2</sub>). yLi<sub>4</sub>SiO<sub>4</sub>, where y ranged from 0 to 10 mol%, were synthesized by mechanical milling of crystalline starting materials, Li<sub>2</sub>S, SiS<sub>2</sub> and Li<sub>4</sub>SiO<sub>4</sub>. At the compositions with large amounts of Li<sup>+</sup> ions, a part of crystalline Li<sub>2</sub>S used as a starting material remained in the milled powder samples. It was found that the milled powder samples in both systems obtained by mechanical milling exhibited high conductivities in the order of 10<sup>-4</sup>S . cm<sup>-1</sup> at room temperature in spite of the presence of small amounts of Li<sub>2</sub>S crystals. The conductivity values of the pelletized samples of xLi<sub>2</sub>S .(100-x)SiS<sub>2</sub> powders maximized at the composition of about x = 60. On the other hand, the conductivities in the composition range with y less than or equal to 5 in the system (100-y) (0.6Li<sub>2</sub>S . 0.4SiS<sub>2</sub>). yLi<sub>4</sub>SiO<sub>4</sub> were nearly the same values in the measured temperature range and higher by a half order of magnitude than those at the composition with y = 10. The transport number of lithium ions of the amorphous materials after mechanically milled was almost unity and the potential window was wider than 10 V at room temperature.

### [27] EFFECT OF CAO DOPING ON ANTIBACTERIAL ACTIVITY OF ZNO POWDERS [JAPANESE]

Yamamoto O. Shimura T. Sawai J. Kojima H. Sasamoto T. - Nippon Seramikkusu Kyokai Gakujutsu Ronbunshi-Journal of the Ceramic Society of Japan. 108(2):156-160, 2000

Effect of doping amount of CaO on the antibacterial activity of ZnO powders was studied by conductance method and colony count method under the condition of enabling and not enabling bacterial growth, respectively. ZnO-CaO solid solution powders when CaO was added in a molar ratio (CaO/ZnO) < 10 mol%, ZnO-CaO solid-solution powders were synthesized by heating at 1400 degrees C for 6h in air, but ratios > 10 mol% resulted in a residual CaO phase in addition to ZnO-CaO solid solution. After milling the powders by planetary ball mill, the average particle size of the obtained powders was 0.5 μm and used in the test of growth-inhibition of bacteria. Evaluation by the conductance method revealed that the increase of CaO in ZnO-CaO powders resulted in a decrease of the growth inhibitory effect against Escherichia coli and Staphylococcus aureus. In addition, the inhibitory effect against S. aureus was found to be stronger than that against E. coli in ZnO-CaO powder slurries. On the other hand, in the case of the colony count method, the killing effect of ZnO-CaO powders on S. aureus markedly increased with increasing the excess CaO in ZnO-CaO powders, i.e., the deposition of CaO from ZnO-CaO solid solution.

### [26] MECHANOCHEMICAL SYNTHESIS AND PROPERTIES OF THERMOELECTRIC MATERIAL BETA-FESI<sub>2</sub>

Belyaev E. Mamylov S. Lomovsky O. - Journal of Materials Science. 35(8):2029-2035, 2000

The mechano-chemical synthesis of thermoelectric material on the basis of beta-FeSi<sub>2</sub> has been investigated. The mixture of FeSi and amorphous Si has been shown to be a optimum precursor to produce the thermoelectric ceramics. The ceramics properties (thermoelectric power alpha, μV/K, electrical conductivity sigma 1/Ohm \* cm) have been considerably improved by means of doping with superequilibrium quantity of 12% of aluminium (substitution of silicon) or 10% of cobalt (substitution of iron). The mechanical alloying in a high energy ball mill, under the acceleration of treating balls 800 m/sec<sup>2</sup> produced homogeneous powder with a superequilibrium quantity of dopant, which converted into thermoelectric ceramics after short annealing in vacuum at low temperature (780 degrees C). The samples of ceramics with the maximum content of doping elements have increased thermoelectromotive force-up to 800 μV/K. Mechanically alloyed ceramic is a promising material as a medium temperature thermoelectric with advanced properties for autonomous power supply units.

**[25] SYNTHESIS OF NANOCRYSTALLITE BY MECHANICAL ALLOYING AND IN SITU OBSERVATION OF THEIR COMBUSTION PHASE TRANSFORMATION IN AL<sub>3</sub>Ti**

Wen CE. Kobayashi K. Sugiyama A. Nishio T. Matsumoto A.- Journal of Materials Science. 35(8):2099-2105, 2000

Elemental powders of stoichiometric Al<sub>3</sub>Ti were mechanically alloyed (MA) in order to investigate the phase formation during the milling process. Furthermore the stability of MA powders were studied under transmission electron microscopy (TEM). The results indicate that a supersaturated Al(Ti) solid solution with nanocrystalline size has been formed after mechanical alloying for 360 ks in consuming the elemental powders of Al and Ti and no further phase transformation can be detected upon longer milling. The MA powders are unstable being irradiated by electron beams under the TEM observation, exothermically forming various intermetallic compounds. The combustion phase transformation processes and products are depending on the time of mechanical alloying. The structural changes and phase transformations during both mechanical alloying process and annealing process were also characterized by using X-ray diffraction measuring.

**[24] EARLY STAGES OF MECHANICAL CRYSTALLIZATION OF AMORPHOUS FEZrBCu SOFT MAGNETIC MATERIAL**

Friedrich J. Herr U. Samwer K. - Journal of Applied Physics. 87(5):2464-2468, 2000

Nanocrystalline Fe-base soft magnetic materials with high saturation magnetization have been obtained by crystallization of FeZrBCu amorphous precursors. In contrast to the conventional thermal crystallization, mechanical crystallization provides an alternative route for the generation of nanocrystalline materials using a high energy ball mill. Special emphasis is put here on the early stages of the transformation. X-ray diffraction, Mossbauer spectroscopy, and magnetization measurements are used to characterize the material. We find a continuous increase of the saturation magnetization accompanied by an increase of the crystalline fraction. The coercivity shows a different behavior with a large increase after very short milling within the amorphous state and a decrease for long milling duration. The influence of the deformation process on the magnetic anisotropy and the coercivity is discussed in terms of stresses and shear band formation. The results are compared with the phase formation and magnetic properties of thermally crystallized FeZrBCu samples and mechanical crystallization studies of other materials.

**[23] MECHANOCHEMICAL SYNTHESIS OF M' MO<sub>4</sub> OXIDES WITH THE SCHEELITE STRUCTURE**

Zyryanov VV. - Inorganic Materials. 36(1):54-59, 2000

The lattice parameters of the crystalline scheelite phases prepared by mechanochemical synthesis in M'O-MO<sub>3</sub> systems were determined by x-ray diffraction. Analysis of x-ray intensities showed that all of the synthesized materials were deficient in the harder constituent. The M'/M atomic ratio was found to correlate well ( $r = 0.91$ ) with the relative difference in Mohs' hardness between the constituent oxides. The structural data obtained on the products of mechanochemical synthesis after similar to 10(2) impacts agree with theoretical predictions for the first impact, according to which mass transfer is due to rolls forming in the contact region between colliding particles, and the product of mechanochemical synthesis is the result of relaxation in a layer of rolls and voids in the process of rapid quenching under negative pressure. Estimates show that, on account of the low temperature in the contact region, the rate of mass transfer by rolls is about 3 orders of magnitude faster than that of diffusive transfer, even though the latter is favored by the deformation intermixing and high vacancy concentration (2 to 3 orders of magnitude higher than that in melts). The term cold melting is in full measure applicable to the mechanochemical processes in question.

**[22] MECHANICAL ACTIVATION OF THE SYNTHESIS REACTION OF BaTiO<sub>3</sub> FROM A MIXTURE OF BaCO<sub>3</sub> AND TiO<sub>2</sub> POWDERS**

Gomez-Yanez C. Benitez C. Balmori-Ramirez H. - Ceramics International. 26(3):271-277, 2000

The influence of long term milling in an attritor of a mixture of BaCO<sub>3</sub> and TiO<sub>2</sub> powders on the reaction synthesis of BaTiO<sub>3</sub> was studied. Thermal analysis (TG and DTA) of the unmilled and milled powders and X-ray diffraction of powders calcined at different temperatures were undertaken. Milling does not change the reaction sequence between BaCO<sub>3</sub> and TiO<sub>2</sub>. BaTiO<sub>3</sub> and Ba<sub>2</sub>TiO<sub>3</sub> are produced in both kinds of powders. However, milling reduces the formation temperature and accelerates the formation rate of these two phases. The production of final BaTiO<sub>3</sub> is incomplete in the milled powder, probably because of the formation of big crystals of Ba<sub>2</sub>TiO<sub>4</sub>. As a consequence, the milled powder contains large amounts of Ba<sub>2</sub>TiO<sub>4</sub> after calcination at 1200 degrees C. Milling produces allotropic transformations in TiO<sub>2</sub> from anatase phase, to alpha-PbO<sub>2</sub>-like phase and finally to rutile structure.

**[21] OPTIMIZING THE RHEOLOGICAL BEHAVIOR OF SILICON NITRIDE AQUEOUS SUSPENSIONS**

Liu XJ. Huang LP. Xu X. Fu XR. Gu HC. - Ceramics International. 26(3):337-340, 2000.

This work focuses on the optimization of the rheological behaviors of the Si<sub>3</sub>N<sub>4</sub> aqueous suspensions by changing the kind and concentration of dispersant, pH value of dispersing medium and other process parameters. Zeta potentials, sedimentation and rheological behavior measurements have been carried out to prepare a well dispersed, uniform and concentrated Si<sub>3</sub>N<sub>4</sub> aqueous suspension. The isoelectric point of Si<sub>3</sub>N<sub>4</sub> powders is at the pH value of 4.2 and the value of Zeta potential is up to its maximum near pH 11. A good agreement between sedimentation and electrophoresis tests is found which identifies the optimum pH value for promising dispersion. Na<sub>2</sub>SiO<sub>3</sub> is an efficient dispersant which increases Zeta potentials in magnitude and improves the fluidity of Si<sub>3</sub>N<sub>4</sub> suspensions effectively. The optimum concentration of dispersant is in the range of 1.0 to 1.2 wt%, which is independent on the solids volume fraction of slips. A ball milling of 8 h helps to improve the fluidity of suspensions while longer milling is detrimental.

**[20] REDUCTION IN DEFECT CONTENT OF OXIDE DISPERSION STRENGTHENED ALLOYS**

Jones AR. Ritherdon J. - Materials at High Temperatures. 16(4):181-188, 1999

Evidence from the literature has been considered for factors controlling the occlusion and retention of gas in powders, particularly those produced by mechanical alloying (MA). A series of experiments has been performed on oxide dispersion strengthened Fe,Al and PM 2000 powders to determine recovery, recrystallisation and vacuum degassing behaviour. As-MA ODS Fe<sub>3</sub>Al powders begin to recover and recrystallise at lower temperatures than PM 2000 (550 degrees C c.f. 750 degrees C, respectively) and recrystallise to a finer grain size (similar to 10 mu m maximum mean linear intercept c.f. similar to 50 mu m in PM 2000). Both powders outgassed hydrogen, as well as smaller quantities

of nitrogen and water vapour. However, PM 2000 released more hydrogen than Fe<sub>3</sub>Al. Both powders contained small pores which are likely to have entrained molecular hydrogen. Defects contained in consolidated secondary recrystallised Fe<sub>3</sub>Al included porosity, residual stringers of fine grains and intrusions. The latter were larger, more numerous and slightly elongated within the fine grained regions suggesting an association

**[19] ADDITION OF A BLOCK COPOLYMER TO POLYMER BLENDS PRODUCED BY CRYOGENIC MECHANICAL ALLOYING**

Smith AP. Ade H. Koch CC. Smith SD. Spontak RJ. - *Macromolecules*. 33(4):1163-1172, 2000

Cryogenic mechanical alloying is used to incorporate a poly(methyl methacrylate-*b*-isoprene) (MI) diblock copolymer into blends of poly(methyl methacrylate) (PMMA) and polyisoprene (PI). Mechanical milling of the copolymer promotes a reduction in the molar mass of the M block, as discerned from glass transition temperature measurements performed by thermal calorimetry, and induces chemical crosslinking of the I block, as determined from sol-gel analysis. These effects become more pronounced with increasing milling time. Morphological characterization of PMMA-rich PI/MI/PMMA blends by X-ray and electron microscopies reveals that the characteristic size scale of the minority phase decreases with increasing MI content, as well as milling time. The nanostructural features observed in such blends are retained at relatively high MI concentrations during subsequent melt-pressing. Impact testing demonstrates that the blends become tougher upon addition of the MI copolymer, even at relatively low copolymer concentrations. Blend toughness likewise increases with increasing milling time up to a point, beyond which phase inversion occurs within the ternary blends (the PI becomes continuous) and impact strength sharply decreases.

**[18] MECHANICAL ACTIVATION EFFECT ON THE TRANSITION OF GIBBSITE TO ALPHA-ALUMINA**

Jang SW. Lee HY. Lee SM. Lee SW. Shim KB. - *Journal of Materials Science Letters*. 19(6):507-510, 2000

**[17] NEUTRON DIFFRACTION STUDY OF MECHANICALLY ALLOYED AND IN SITU ANNEALED AL<sub>75</sub>MO<sub>25</sub> POWDERS**

Enzo S. Frattini R. Canton P. Monagheddu M. Delogu F. - *Journal of Applied Physics*. 87(6):2753-2759, 2000

The mechanical treatment of a Al<sub>75</sub>Mo<sub>25</sub> mixture of pure elemental powders in a high-energy mixer mill induces partial solid state reactivity and solid solution formation. This is suggested by a quantitative phase evaluation and by the changes of Al lattice parameter carried out with Rietveld analysis of diffraction patterns collected after extended time of processing (4, 8, 16, 32, 57, and 78 h). The small angle neutron scattering experiments showed that diffusion processes are the rate-controlling step for these solid state reactions. The formation of metastable phases is confirmed by in situ neutron diffraction annealing experiments on selected as-milled powders. In the specimen mechanically alloyed for 4 h, Al<sub>12</sub>Mo phase is formed at 590 degrees C (below the aluminum melting point). Soon after this temperature, the remaining Al is consumed to form the Al<sub>8</sub>Mo<sub>3</sub> phase. In the alloy mechanically treated for 32 h, the Al<sub>12</sub>Mo phase appears after annealing at 430 degrees C, while the Al<sub>8</sub>Mo<sub>3</sub> phase is found at 493 degrees C. After the disappearance of Al<sub>12</sub>Mo phase (500 degrees C), the solid state reaction proceeds to form a new tetragonal Al<sub>3</sub>Mo phase, not reported in the equilibrium phase diagram. In the specimen mechanically treated for 57 h, the total formation of Al<sub>8</sub>Mo<sub>3</sub> is recorded at 430 degrees C. Conversely, in the powder ball milled for 78 h, the Al<sub>8</sub>Mo<sub>3</sub> phase appears at 390 degrees C and coexists with tetragonal Al<sub>3</sub>Mo.

**[16] NANOSTRUCTURED COMPOSITE OBTAINED BY MECHANICALLY DRIVEN REDUCTION REACTION OF CUO AND AL POWDER MIXTURE**

Wu JM. Li ZZ. - *Journal of Alloys & Compounds*. 299(1-2):9-16, 2000

The reduction reaction between Al and CuO has been induced by ball milling of the powder mixture. The reaction, in which CuO is believed to be reduced gradually by Al, is controlled by diffusion of the atoms and ions. The reduced metal Cu reacts with Al spontaneously to form the metastable Al<sub>4</sub>Cu<sub>9</sub> phase during ball milling, which transforms into the equilibrium CuAl<sub>2</sub> after annealing. Hot pressing is performed to synthesize the as-received Al-5CuO alloy powders and a nearly full density nanostructured aluminum matrix composite reinforced with CuAl<sub>2</sub> (100-500 nm in size) and Al<sub>2</sub>O<sub>3</sub>, Al<sub>4</sub>C<sub>3</sub> (10-50 nm in size) is obtained. The mean grain size of the matrix is determined to be 73.6 nm by the whole-pattern least-squares fitting method using XRD data, further confirmed by TEM observation. It is also found that solution of Cu in the Al matrix is inhibited due to the presence of the fine oxide and carbide particles. Compressive tests reveal that the nanostructured composite exhibits excellent strength both at ambient and elevated temperature, which is attributed to the fine dispersoids and nano-sized grain of the Al matrix.

**[15] PRELIMINARY CHARACTERIZATION OF THE INTERMETALLIC 'YNI' OBTAINED BY BOTH MECHANICAL GRINDING AND ALLOYING**

Nakhl M. Chevalier B. Bobet JL. Darriet B. - *Journal of Alloys & Compounds*. 299(1-2):94-100, 2000

The intermetallic compound YNi and the (Y + Ni) mixture were submitted to a high-energy milling process under argon atmosphere. X-ray powder diffraction and microprobe analysis revealed in both casts the formation of a new phase 'YNi'. Its structural properties were different from those of the YNi as-cast sample (orthorhombic FeB type) and presented some similarities with GdNi (orthorhombic CrB type) milled under the same conditions. The application of isostatic pressure on the YNi as-cast sample gives a comparable result. This non-equilibrium material 'YNi' still exists even after annealing treatments performed up to 873 K. The presence of air during milling leads to the formation of a mixture of (oxy)nitride Y(O,N) and Ni metal and the new phase 'YNi' is not synthesized under such conditions. Also, the influence of the milling process on the magnetic properties of similar compounds such as GdNi and ErNi is discussed.

**[14] ELECTROCHEMICAL AND STRUCTURAL CHARACTERISTICS OF TiV<sub>2</sub>.1Ni<sub>0.3</sub> SURFACE-MODIFIED BY BALL-MILLING WITH MgNi**

Choi WK. Tanaka T. Miyauchi R. Morikawa T. Inoue H. Iwakura C. - *Journal of Alloys & Compounds*. 299(1-2):141-147, 2000

V-based TiV<sub>2</sub>.1Ni<sub>0.3</sub> alloy with high hydrogen storage capacity was surface-modified by ball-milling with amorphous MgNi alloy prepared by mechanical alloying. In charge-discharge cycle measurements, the decrease in discharge capacity for the prepared TiV<sub>2</sub>.1Ni<sub>0.3</sub>-MgNi composites was effectively suppressed in comparison with the TiV<sub>2</sub>.1Ni<sub>0.3</sub> alloy. In particular, ball-milling for 3 h is the most effective in the present study. This was explained by

surface analyses with EPMA mapping and X-ray photoelectron spectroscopy (XPS). Changes in the EPMA maps, XPS spectra and depth profiles of the surface alloy components suggested that the ball-milling caused the mutual diffusion between Mg and a little of the Ni components in the MgNi alloy and Ti and V components in the TiV<sub>2</sub>.1Ni<sub>0.3</sub> alloy at the interface between both alloys. In addition, stable time course of rest potential for the TiV<sub>2</sub>.1Ni<sub>0.3</sub>-MgNi composite electrodes immersed in 6 M KOH solution also showed the effectiveness of the surface modification with ball-milling.

**[13] MECHANICALLY INDUCED SOLID STATE CARBURIZATION FOR FABRICATION OF NANOCRYSTALLINE ZrC REFRACTORY MATERIAL POWDERS**

Mahday AA. El-Eskandarany MS. Ahmed HA. Amer AA. - Journal of Alloys & Compounds. 299(1-2):244-253, 2000

Nanocrystalline powders of the nearly equiatomic composition Zr(56)hC(44) have been successfully synthesized at room temperature by high-energy ball milling of elemental Zr and C powders. For the purpose of the present study, X-ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM) have been employed to monitor the progress of the solid state reaction at several stages of the milling time. A complete single phase of fcc-ZrC was obtained after 173 ks of milling, time. No free Zr and/or C crystals could be detected at this final stage of milling. The lattice parameter of the as-milled ZrC was calculated to be 0.47082 nm. The fabricated ZrC powders possess excellent morphological characteristics, such as homogeneous shape (spherical-like morphology) with fine and smooth surface relief and uniform size (less than 0.5  $\mu$ m in diameter). These fabricated refractory material powders have a cell-like structure with nanoscale dimensions of about 5 nm in diameter. Cold and hot pressing techniques have been used to consolidate the end-product of the milled powders (259 ks) into a fully dense (>99.5%) compact. In the consolidation procedure, the powders were pressed at 1573 K with a pressure of 1.0-1.5 GPa for 43 ks. This consolidation step led to a remarkable grain growth, and the compacted Zr-C sample contained grains larger than 95 nm in diameter, but maintained its nanocrystalline unique characteristics. The density and Vickers hardness of the bulk ZrC were measured as 6.56 g/cm<sup>3</sup> and 27 GPa, respectively. A model for the formation of nanocrystalline fully dense refractory materials is proposed, taking the ZrC binary system as a typical example.

**[12] METASTABLE PHASE FORMATION BY CHEMICAL LEACHING OF AL-CO-CU TERNARY ALLOYS**

Yamauchi I. Ohmori M. Ohnaka I. - Journal of Alloys & Compounds. 299(1-2):269-275, 2000

The formation of a metastable nanocrystalline Co-Cu alloy was attempted by means of chemical leaching of Al atoms from various ternary Al-Co-Cu alloys prepared by rapid solidification or mechanical alloying. Almost all Al atoms were removed by the chemical leaching and fine particles of a supersaturated metastable Co-Cu solid solution were formed by changing the chemical composition and the crystallographic structure from the original one to fcc. Most of the particle sizes were below one hundred nanometer. A few nanometer size particles were also observed by TEM observation. The supersaturated solid solution decomposed into Co and Cu phases after a heat treatment. The variation of the saturation magnetization of the leached specimens gradually decreased with increasing temperature. After reaching a minimum, the saturation magnetization increased and approached the normal value of fcc Co. This variation was the result of the precipitation of Co from the supersaturated fcc phase. The DSC curves also showed an exothermic peak indicative of Co precipitation and corresponding to the variation of the saturation magnetization with temperature. Precipitation was also confirmed by X-ray diffraction. It was concluded that the chemical leaching process might open the possibility to form new metastable materials.

**[11] RAPID SOLIDIFICATION AND MECHANICAL ALLOYING OF AL-CO-CU TERNARY ALLOYS FOR CHEMICAL LEACHING**

Yamauchi I. Ohmori M. Ohnaka I. - Journal of Alloys & Compounds. 299(1-2):276-282, 2000

Various precursors of Al<sub>75</sub>Co<sub>x</sub>Cu<sub>25-x</sub> (x = 0-25) ternary alloys intended for chemical leaching were prepared by slow or rapid solidification processes and by mechanical alloying. Their structures were examined by SEM observation, EPMA, X-ray diffraction and DSC measurements. The as-prepared structure of these alloys strongly depended on the applied process. In an Al<sub>75</sub>Co<sub>12.5</sub>Cu<sub>12.5</sub> alloy, four equilibrium phases were formed by slow solidification and they were Al<sub>2</sub>Cu, Al<sub>7</sub>CoCu<sub>2</sub>, Al<sub>13</sub>Co<sub>3</sub> and Al. The formation of the equilibrium phases Al<sub>7</sub>CoCu<sub>2</sub> and Al<sub>9</sub>Co<sub>2</sub> was completely suppressed by rapid solidification and instead, a small amount of a metastable phase having a simple cubic structure was newly formed. The crystallographic structure of the mechanically alloyed specimens varied with milling time and alloy composition. Only a simple cubic structure was formed after milling for 172.8 ks in the case of the Al(75)Co(12.5)Cu(12.5) alloy. It decomposed to the equilibrium phases after annealing at 1073 K for 3.6X10<sup>3</sup> s. In the alloys containing more than 8 at.% Co, no single-phase structure was formed by rapid solidification and but only by mechanical alloying. Mechanical alloying proved to be the only effective process to obtain a single phase.

**[10] NANOCOMPOSITE ND-FE-B TYPE MAGNETS**

Jurczyk M. - Journal of Alloys & Compounds. 299(1-2):283-286, 2000

The temperature dependences of magnetic properties for nanocomposite two-phase Nd<sub>12.6</sub>Fe<sub>69.8</sub> - xCo<sub>11.6</sub>Zr<sub>x</sub>B<sub>6</sub>/alpha-Fe (x = 0 and 0.5) hot pressed magnets, with an excess of alpha-Fe (10, 20, 37.5 and 50 vol.%), have been studied. These materials have been prepared by high-energy ball-milling and annealing. For example, hot pressing at 830 degrees C of Nd<sub>12.6</sub>Fe<sub>69.3</sub>Co<sub>11.6</sub>Zr<sub>0.5</sub>B<sub>6</sub>/alpha-Fe, containing 37.5 vol.% alpha-Fe, resulted in isotropic magnets with J(r) = 0.95 T, H-J(c) = 427 kA m(-1) and p similar to 7.59 g cm(-3). The temperature coefficients (from 20 to 140 degrees C) of remanence alpha(J(r)) and coercivity beta(H-J(c)) of this magnet are: -0.07% degrees C(-1), -0.35% degrees C(-1), which are smaller than that of sintered Nd-Fe-B magnets.

**[9] LITHIUM STORAGE PROPERTIES OF NANOCRYSTALLINE ETA-CU<sub>6</sub>SN<sub>5</sub> ALLOYS PREPARED BY BALL-MILLING**

Wang GX. Sun L. Bradhurst DH. Dou SX. Liu HK. - Journal of Alloys & Compounds. 299(1-2):L12-L15, 2000

Nanocrystalline eta-Cu<sub>6</sub>Sn<sub>5</sub> alloy powders were prepared by high energy ball-milling. Lithium ions can be electrochemically inserted into Cu<sub>6</sub>Sn<sub>5</sub> electrodes, alloying with Sn to form Li<sub>x</sub>Sn alloys. Simultaneously, an inactive Cu matrix is produced, which could buffer the volume expansion of the active Sn due to the formation of Li<sub>x</sub>Sn alloys. It appears that lithium can react reversibly with the nanocrystalline Cu<sub>6</sub>Sn<sub>5</sub> alloy to some extent. A reversible

capacity of similar to 400 mAh/g has been achieved in preliminary tests. The results of ex-situ X-ray diffraction support the above proposal.

**[8] MECHANISM AND KINETICS OF MECHANOCHEMICAL PROCESSES IN COMMINUTING DEVICES 2. APPLICATIONS OF THE THEORY. EXPERIMENT**

Urakaev FK. Boldyrev VV. - Powder Technology. 107(3):197-206, 2000

The equations describing the kinetics of contact melting and crystallization of the substances have been deduced on the basis of the obtained distributions of temperature and pressure impulses during impact-friction interaction of the particles treated in comminuting devices. Possible mechanisms of the formation of nanocrystal particles and of chemical reactions during the crystallization of thin films of a melt at high rates of local temperature changes in the near-contact regions have been studied. Various examples are presented that deal with the application of the generalized kinetic equation to the calculations of ab initio rate constants of specific mechanochemical processes in comminuting devices. The obtained theoretical values have been compared with experimental results.

**[7] INFLUENCE OF MECHANICAL ACTIVATION ON THE ALKALINE LEACHING OF ENARGITE CONCENTRATE**

Balaz P. Achimovicova M. Bastl Z. Ohtani T. Sanchez M. - Hydrometallurgy. 54(2-3):205-216, 2000

In this study the alkaline leaching of enargite  $\text{Cu}_3\text{AsS}_4$  (El Indio, Chile) in the medium of sodium sulphide was investigated. The rate of leaching can be influenced by the pre-treatment consisting of mechanical activation of the concentrate in a stirring ball mill (attritor). The XRD and XPS methods used to characterise the bulk and surface properties of the solid phase after leaching have shown that arsenic extraction from enargite leads to its transformation to covellite  $\text{CuS}$ . On the basis of the value of experimental activation energy (62  $\text{kJmol}^{-1}$ ) we can conclude that a chemical reaction is the rate-determining process of the reaction between  $\text{Cu}_3\text{AsS}_4$  and  $\text{Na}_2\text{S}$ . The applied procedure represents a potentiality of de-arsenification of sulphidic concentrates and preparation of a charge convenient for further processing, e.g., by pyro-treatment.

**[6] LUMINESCENCE SPECTRA OF ALKALI FELDSPARS: INFLUENCE OF CRUSHING ON THE ULTRAVIOLET EMISSION BAND**

Garcia-Guinea J. Correcher V. - Spectroscopy Letters. 33(1):103-113, 2000

Grinding and milling processes lower the intensity of the ultraviolet emission band of alkali feldspars. The luminescence spectra of aliquots of natural transparent adularia from Saint Gothard, Switzerland, that were crushed at different energies, show the irreversible collapse of the UV 290 nm peak. Simultaneously, the 390 nm blue emission increases in accordance with the milling treatment, which reduces the presence of ionic charge compensators ( $\text{Na}^+$ ) and sensitizes the structure (producing  $[\text{AlO}_4]$  degrees centers). The annihilation of the 290 nm UV peak by crushing could be linked with cracks-strain-exsolution features of the lattice of adularia. For this reason, the use of this 290 nm peak and energetic milling treatments in dating and dosimetric routines, should be rejected.

**[5] MOSSBAUER STUDY OF THE INTERFACE OF IRON NANOCRYSTALLITES**

Balogh J. Bujdoso L. Kaptas D. Kemeny T. Vincze I. Szabo S. Beke DL. - Physical Review B. 61(6):4109-4116, 2000

The hyperfine parameters of iron atoms are studied in iron nanocrystallites prepared by different methods: ball milling of iron powder, partial crystallization of Fe-Zr-B-Cu amorphous ribbons, and vacuum evaporation of Fe-B polycrystalline multilayers. Careful analysis of the spectral contribution of the possible impurities and chemical mixing at interfaces reveals that no specific grain boundary contribution can be separated in the Mossbauer spectra when the grain size is in the 2-10 nm range. The results indicate that excluding chemical effects the hyperfine fields of iron atoms at the bcc interfaces are very close to those in the bulk, and Mossbauer spectra of the iron nanocrystallites studied can be understood without supposing a separate grain boundary phase with very distorted structure or highly reduced density.

**[4] PHASE EVOLUTION IN MECHANICALLY TREATED MIXTURES OF KAOLINITE AND ALUMINA HYDRATES (GIBBSITE AND BOEHMITE)**

Temuujin J. MacKenzie KJD. Schmucker M. Schneider H. McManus J. Wimperis S. - Journal of the European Ceramic Society. 20(4):413-421, 2000

The phase evolution behaviour of kaolinite-gibbsite mixtures ground for 5 min and 4 h has been investigated by X-ray powder diffraction (XRD). Differential scanning calorimetry (DSC) and MAS NMR. The thermal behaviour of mixtures ground for 5 min was similar to that of kaolinite-alpha-alumina mixtures. After grinding for 4 h, the mixture is transformed into an amorphous state. Grinding caused the acceleration of thermal reactions in these mixtures, with a degree of mechanochemical reaction being found to occur between kaolinite and alpha-alumina. Grinding kaolinite-boehmite mixtures produced mullite precursors which were more homogeneous than those in which the kaolinite had been dehydroxylated, suggesting the participation of the structural water from the kaolinite. Secondary mullite is formed during thermal reaction of these mixtures by a solution-precipitation mechanism. The mullite initially formed was alumina-rich, but approached the stoichiometric composition with increasing firing temperature.

**[3] ON THE DISCONTINUOUS GRAIN GROWTH OF  $\text{Sr}_x\text{Ba}_{1-x}\text{Nb}_2\text{O}_6$  CERAMICS**

Fang TT. Chen E. Lee WJ. - Journal of the European Ceramic Society. 20(4):527-530, 2000

Strontium barium niobate powders with various compositions have been milled and annealed at a low temperature, 1000 degrees C. It was found that powders of  $\text{Sr}_x\text{Ba}_{1-x}\text{Nb}_2\text{O}_6$  with  $x > 40$  were partially decomposed and the higher the Sr/Ba ratio, the more they decomposed. It was also found that pre-treatment at or higher than complete formation temperature could prevent discontinuous grain growth by evading the development of liquid phase. The possible reasons for the development of liquid phase and discontinuous grain growth are proposed.

**[2] SYNTHESIS OF NONSTOICHIOMETRIC AMORPHOUS MG-BASED ALLOY ELECTRODES BY MECHANICAL MILLING**

Sun L. Wang GX. Liu HK. Bradhurst DH. Dou SX. - Electrochemical & Solid-State Letters. 3(3):121-124, 2000

Nonstoichiometric amorphous Mg-Ni and Mg-Ni-V alloys were synthesized by mechanical milling the crystalline Mg<sub>2</sub>Ni alloy with Ni and/or V powders. All the nonstoichiometric amorphous Mg-based alloys result in Mg-based alloy electrodes with very high discharge capacities by comparison with crystalline Mg<sub>2</sub>Ni alloys. The results indicate that nonstoichiometric amorphous Mg-based alloys can be obtained either by increasing the Ni content, adding a range of other elements, or both, using a mechanical milling method. The nonstoichiometric Mg-based alloy electrodes studied have shown improved initial discharge capacities compared with the stoichiometric amorphous MgNi alloy. These results describe a method of achieving better Mg-based alloy electrodes with high discharge capacities and improved cycle life. The method enables a larger composition range to be achieved with a range of vanadium additions.

**[1] MECHANOCHEMICAL DEGRADATION OF 2,4-D ADSORBED ON SYNTHETIC BIRNESSITE**

Nasser A. Sposito G. Cheney MA. - Colloids & Surfaces A-Physicochemical & Engineering Aspects. 163(2-3):117-123, 2000

Mechanochemical degradation of 2,4-D (2,4-dichlorophenoxyacetic acid) adsorbed on synthetic birnessite ( $\delta$ -MnO<sub>2</sub>) was investigated using heat conduction calorimetry. The overall transformation kinetics of 2,4-D on birnessite after light grinding were approximately first-order, with an apparent activation energy of approximately 37 kJ mol<sup>-1</sup> for the range of temperatures 10-50 degrees C. The two decomposition products detected under mechanochemical degradation and incubation were 2,4-dichlorophenol and CO<sub>2</sub>, but no consumption of gaseous oxygen was detected. A positive correlation was found between Mn(II) produced and CO<sub>2</sub> evolved, suggesting that the decomposition of 2,4-dichlorophenol involves the oxide substrate as a source of oxygen and yields Mn(II).

**Correspondants du Réseau Français de Mécanosynthèse  
176 Laboratoires ou Groupes de Recherche**

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

**Allemagne**  
.....

**Angleterre**  
.....

**Argentine**  
.....

**Australie**  
.....

**Brésil**  
.....

**Canada**  
.....

**Chine**  
.....

**Corée du Sud**  
.....

**Croatie**  
.....

**Danemark**  
.....

**Egypte**  
.....

**Espagne**  
.....

**Grèce**  
.....

**Hongrie**  
.....

**Inde**  
.....

**Israël**  
.....

**Italie**  
.....

**Japon**  
.....

**Nouvelle - Zélande**  
.....

**Pologne**  
.....

**Portugal**  
.....

**Roumanie**

.....

**Russie**

.....

**Singapour**

.....

**Slovaquie**

.....

**Suède**

.....

**Tunisie**

.....

**U.S.A.**

.....

**Viet Nam**

.....

**Yougoslavie**

.....

**France**

.....

\*\*\*\*\*

**Bulletin d'adhésion 2000 / Subscription Print**

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

**Eric GAFFET**

UPR CNRS 806

Groupe "Nanomatériaux : Elaboration et Transitions de Phases Hors Equilibre"

Université de Technologie de Belfort - Montbeliard

Site de Sévenans

F90010 - Belfort Cedex - France

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

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

.....

.....

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

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

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

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

**The check has to be to the order : Reseau Francais de Mecanosynthèse**

(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

