

RESEAU FRANCAIS DE MECANOSYNTHESE

Lettre N°71

Février 2001

181 Groupes de Recherche
(dont 108 à l'étranger / 32 Pays)

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

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Annonce des JRFM'2001
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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.

Bulletin d'adhésion 2001 / Subscription Print

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

Eric GAFFET

UMR5060 – Métallurgies et Cultures

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).

JRFM' 2001
6 émes Journées du Réseau Français de Mécanosynthèse
Amiens
Pôle Scientifique Faculté des Sciences
Les 21 et 22 mai 2001
<http://www.u-picardie.fr/colloque/jrfm>

Thématique 2001:
Influence de la Mécanosynthèse sur les Propriétés
Physico - Chimiques des Matériaux

Fiche d'Inscription

(à renvoyer à Luc AYMARD avant le 31.01. 2001)

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

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

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

Frais d'inscription: (comprenant recueil des résumés, 2 déjeuners, un dîner)

Déjeuner du 21 mai oui / non
Banquet du 21 mai soir oui / non (merci d'entourer les réponses)
Déjeuner du 22 mai oui / non

Tarifs : **Etudiant(e)s de thèse : 100 Frs.** **Autres participant(e)s: 400 Frs.**

Mode de paiement :

* Dès la réception du bulletin d'inscription dûment complété par vos soins et d'un chèque ou d'un bon de commande établi à l'ordre de VERNE ADER,
une facture sera établie pour paiement : **aucun règlement n'est à effectuer à l'inscription!!!!!!**

Conditions de résiliation: En cas de désistement, aucun règlement ne sera restitué.

.....
Fiches d'inscriptions et résumés à retourner avant le 31 02 2001 à Luc Aymard
(JRFM 2001) Faculté des Sciences, LRCS
33 rue Saint leu Amiens 80000
tel: 03 22 82 75 74 fax : 03 22 82 75 90 e-mail: luc.aymard@u-picardie.fr

Date limite d'Envoi des résumés: 02 avril 2001

IMPORTANT: Les frais d'inscription ne comportent pas l'adhésion au RFM au titre de l'année 2001. Pour participer aux JRFM2001, il est impératif d'envoyer votre cotisation de 100 Frs. à l'ordre du RFM (pour tout renseignement complémentaire sur cette adhésion contacter E. Gaffet)

RUSSIAN ACADEMY OF SCIENCES

SIBERIAN BRANCH

INSTITUTE OF SOLID STATE CHEMISTRY AND MECHANOCHEMISTRY

International Conference
FUNDAMENTAL BASES OF
MECHANOCHEMICAL TECHNOLOGIES



August 16 - 18, 2001

First Circular and Call for Papers

Novosibirsk
RUSSIA

SCOPE

The International Conference **Fundamental Bases of Mechanochemical Technologies** will be held in the Scientific Centre of the Russian Academy of Sciences situated in Academgorodok of Novosibirsk. This conference is devoted to all aspects of theory, methods and applications of mechanochemistry. The scientific programme will consist of invited lectures, oral, and poster communications.

INTERNATIONAL ADVISORY COMMITTEE

1. **V.V. Boldyrev**, Institute of Solid State Chemistry, Russia
2. **E.G. Avvakumov**, Institute of Solid State Chemistry, Russia
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14. **G.Cocco**, Sassari University, Italy

LOCAL ORGANIZING COMMITTEE

1. N. Lyakhov - chairman
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3. T. Shakhshneider - scientific secretary
4. V. Isupov
5. N. Uvarov
6. T. Grigorieva

7. E. Yelsukov
8. A. Yermakov
9. V. Sadykov
10. A. Sreletskii

TOPICS

- Theoretical aspects of mechanical activation
- Mechanochemical reactions, kinetics and mechanisms
- Control of the reactivity of solids by mechanical activation
- Mechanical alloying
- Mechanochemistry of organic systems
- Mechanochemistry for design of new materials including nanosized and composite materials
- Development of mechanochemical technologies

ACCOMODATION

Accommodation will be arranged at the hotel "Zolotaya Dolina" ("Golden Valley") in Academgorodok. This is a very quiet and ecologically pure place situated in the plain forest near the artificial Ob See. All Conference events are planned to be organized on the bases of the House of Scientists which is perfectly adapted for scientific meetings.

LANGUAGE

The official language of the Conference will be English, and no simultaneous translation will be provided.

CLIMATE

In August the usual temperature in Novosibirsk can vary from 15⁰C to 25⁰C with a few rains per a week. Sport clothing is recommended. Some years swimming is possible in the artificial Ob See at this period of summer when water temperature reaches 22 - 24⁰C.

SOCIAL PROGRAMME

Some local sightseeing will be arranged.

APPLICATION FORM

Surname, First name _____

Title _____

Affiliation _____

Mailing adress _____

Phone _____

FAX _____

E-Mail _____

Preferred form of presentation _____

Title of paper, names of co-workers, affiliation, city, country, postal code (in English)

Date

Signature

Please, return this form not later than March 1, 2001

CALL FOR PAPERS

All abstracts will be published before the Conference. The one-page abstracts should be submitted by e-mail in Microsoft Word format to conf@solid.nsc.ru, following the format provided on the Conference Web site: <http://www.solid.nsc.ru>

The Proceedings will be published in the Journal "Chemistry for Sustainable Development" after the Conference both in English and in Russian. All papers will be refereed according the procedure adopted in this Journal. The instructions for authors will be available on the Conference Web site. The manuscripts should be submitted during the Conference time.

DEADLINES

March 1 st	Application Form submission
April 1 st	Abstract submission
June 15 th	Early registration
June 15 th	Hotel reservation deadline
August 16 th	Manuscript deadline

CORRESPONDENCE

Prof. N. Lyakhov
Institute of Solid State Chemistry and Mechanochemistry
Kutateladze 18, Novosibirsk 630128
RUSSIA.
e-mail: conf@solid.nsc.ru
FAX: 7 (383-2) 32 28 47
Phone: 7 (383-2) 32 86 83

The information is available at the Web site of the Institute of Solid State Chemistry and Mechanochemistry:
<http://www.solid.nsc.ru>

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Annnonce de congres et / Ou Ecoles
Congress and School Announcements
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**International Conference on Trends
in Mechanical Alloying Science, Technology and Applications (TMA-2001)**

Janpur, India Feb. 21-23, 2001.

Secretariat of Int. Conf. TMA-2001

Organizer : Dr. P. R. Soni

Department of Metallurgical Engineering,

Malaviya Regional Engineering College

Jaipur-302017, India

Tel : +91-0141-702042

Fax : +91-0141-702954

E-mail : <mailto:psmt@arya.recjai.ernet.in>

Contact Persons : Dr. P. R. Soni - Prof. T. V. Rajan

Particles 2001

24-27 February 2001

Rosen Center Hotel, Orlando, FL

<http://www.nanoparticles.org/>

Journées Annuelles 2001 du GFC

Ecole des Mines de St Etienne

22 / 22 Mars 2001

Thèmes prévus :

Corrosion - Filtration - Tribologie - Capteurs

Contacts : B. Guilhot et F. Thévenot

Ecole Nationale Supérieure des Mines de St Etienne

158 Cours Fauriel

42023 - St Etienne Cedex

E-Mail : <mailto:Thevenot@emse.frou> <mailto:BGuilhot@emse.fr>

Rmq : Propositions de communications avant le 15 Janvier 2001

Science et Technologie des Poudres

Nancy - France

3 - 5 Avril 2001

website : <http://www.inpl-nancy.fr/stpoudres3.html>

e-Mail : <mailto:stpoudres@inpl-nancy.fr>

Australian Workshop on Nanotubes and Fullerenes

Australian National University, Canberra,

Mai 3- 4, 2001

Scope

Fullerenes, nanotubes and related nanomaterials are receiving great interest due to the new properties and to potential application in various fields. A workshop is designed to bring together research scientists and engineers working in various disciplines in the broad area of nanotube and Fullerene -related materials and to provide an opportunity to exchange new ideas and results. Students are encouraged to attend with free registration.

Topics

Thermodynamics and Modeling, Synthesis and Processing, Characterization, Properties and Applications

First announcement and call for paper

Send your abstracts and registration by e- mail attachment to awnf200@ anu. edu. au. Abstract format and registration form can be found at: <http://rsphysse.anu.edu.au/nanotube/awnf2001/>

For more information please contact Dr Ying Chen, Department of Engineering & Research School of Physical Science and Engineering, The Australian National University, ACT 0200.

Ph: 61 02 62490380, Fax: 61 02 62798338,

E- mail: <mailto:ying.chen@anu.edu.au>.

Partial list of invited speakers:

Prof. D. Tomanek, MSU, USA Prof. G. Wallace, University of Wollongong

Prof. H. M. Cheng, IMR, CAS, China Dr. L. M. Dai, CSIRO

Prof. M. Wilson, UTS

PM2 TEC2001

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

JRFM'2001

21 et 22 Mai 2001 - Amiens - France
Thème : Influence de la mécanosynthèse sur les propriétés physico - chimiques des matériaux
Contact : Luc.Aymardsc.u-picardie.fr
ou <mailto:Eric.Gaffet@utbm.fr>

7th International Symposium on Agglomeration

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

ISMANAM2001

University of Michigan, Ann Arbor, Michigan, USA
Ann Arbor, Michigan, 24-29 June, 2001
<http://www.ners.engin.umich.edu/ISMANAM2001>

Abstract deadline is March 1st, 2001.

Abstracts of 200-400 words should be submitted by e-mail to

E-Mail : mailto:ISMANAM-2001@umich.edu

The International Symposium on Metastable, Mechanically Alloyed and Nanocrystalline Materials (**ISMANAM 2001**) will be held at the University of Michigan in Ann Arbor, Michigan, United States during 9-14 June 2001. Topics to be covered include nanostructured materials (e.g., nanocrystals or nanoparticles) as well as amorphous and other metastable materials. Both fundamentals and applications will be addressed. We also expect to involve US scientists who have not participated in ISMANAM before. As you may know, previous ISMANAM were held in Grenoble, Quebec City, Rome, Sitges (Spain), Wollongong (Australia), Dresden and Oxford. Next year's ISMANAM will be the first to be held in the United States.

A preliminary list of invited speakers includes:

P. Bellon (U. of Illinois), T. Benamer (Tunisia), A. Calka (Wollongong, Australia), J. Eckert (Dresden), A. L. Greer (Cambridge, UK), A. Hernandez Grande (Madrid), A. Inoue (IMR, Sendai), W. L. Johnson (Caltech), J. H. Perepezko (U. of Wisconsin), R. Schulz (IREQ, Montreal), R. W. Siegel (RPI), R. B. Schwarz (Los Alamos), A. Yermakov (Russ. Academy of Sciences, Ekaterinburg)

**COLLOQUE SUR LES INNOVATIONS
DANS LES MATERIAUX FRITES**

Poitiers-Futuroscope
3-4-5 juillet 2001

consulter le site <http://www.sf2m.asso.fr/>(rubriques sommaires puis conférences)

International Conference on the Applications of the Mossbauer Effect

Oxford, UK
2-7 September 2001

Abstracts are now invited for for the above meeting, which is the next in the ICAME conference series. You are asked to submit your abstract via the conference website <http://www.iop.org/IOP/Confs/ICAME/> by no later than 1 April 2001.

For further information or enquiries please contact the Conference Office at the Institute of Physics, 76 Portland Place, London W1B 1NT, UK.

E-mail should be directed to: <mailto:rebecca.chapple@iop.org>

International Conference
"FUNDAMENTAL DASES of MECHANOCHEMICAL TECHNOLOGIES"
Novosibirsk, Russia, August 16-18, 2001

Contact: Prof. N. Lyakhov
Institute of Solid State Chemistry
E-mail: mailto:Conf@solid.nsc.ru
Fax: +7 3832 32 28 47

The first circular is available on WEB-Site of the Institute:
<http://www.solid.nsc.ru/>

(IPCM 2001)

La 7eme conference internationale sur les phenomenes d'interface dans les materiaux composites (IPCM 2001) se tiendra au palais des congres d'Arcachon (40 km de Bordeaux) du 11 au 14 septembre 2001.

Les themes suivants y seront abordés : Interfaces dans les Biocomposites et fibres naturelles, Composites à matrice organique, Composites à matrice métallique, Composites à matrice céramique, Nanocomposites, avec un interet particulier sur l'elaboration, les relations micro-macro, la modelisation des mecanismes aux interfaces.

Conférenciers (liste provisoire)

Prof. J. VINCENT (Université de Reading (G.B)) :

Comment la structure des coquillages peut-elle nous aider à concevoir des structures composites modernes ?

Prof. D. ROUBY (INSA de Lyon (Fr)) :

Approche tribologique des interfaces dans les matériaux composites céramiques

Prof. N. CHANDRA (Florida University (USA)) :

Les mécanismes de rupture aux interfaces dans les composites à matrice métallique

Prof. NOBUO TAKEDA (University of Tokyo (Jp)) :

Le cisaillement aux interfaces dans les matériaux polymériques : passage du micro au macrocomposite.

Dr J. DOUIN (ONERA (Fr)) :

Comment la connaissance des interfaces fibre/matrice par microscopies peut-elle aider les mécaniciens à concevoir leurs modèles ?

<http://www.arcachoncongres.com/ipcm2001/>

La date limite pour envoyer votre résumé est fixée au 31/12/2000.

(IWSIS-3)

October, 7-12, 2001.

3rd International Workshop on Surface and Interface Segregation, Island of Porquerolles, French Riviera,

This Workshop is devoted to the study of the segregation phenomenon
in defects of crystallized solids (surface, grain boundary, interface of
interphase...)

INFOS : <http://www.crmc2.univ-mrs.fr/confs/iwsis>

SOUTENANCES DE THESE

T. Ziller

Etude du Mélange à l'Etat Solide lors de la mécanosynthèse d'alliages Fe - X
(X = Cr, Mn, V, Mo) et Etude de la mise en ordre d'alliages Fe - V élaborés par cette Technique

INPL - Ecole des Mines de Nancy

22 Décembre 2000

Jury : J. Foct (Pdt), E. Gaffet (Rapp.), JF Dinhut (Rapp.), L. Chaffron, O. Isnard, G. Le Caer (Dir.)

Th. Grosdidier

Habilitation à Diriger des Recherches

20 Décembre 2000 à 10h00, salle de conseil de l'ISGMP – Ile du Saulcy

LETAM (UMR 7078), Université de Metz.

Jury : Rapporteurs : Pr. Elisabeth Gautier, Pr Jacques Foct, Pr. Günter Gottstein, Pr. David G. Morris - Examineurs : Pr. Marie-Jeanne Philippe, Pr Panos Tsakirooulos, Pr. Francis Wagner.

V. Gauthier

Elaboration et réactivité à hautes températures du composé intermétalliques NbAl₃.

Influence du mode de préparation sur le processus d'oxydation

18 Décembre 2000

Jury : G. Bertrand (Pdt), F. Nardou (Rapp.), M. Vilasi (Rapp.), E. Gaffet, F. Bernard, J.P. Larpin

A. C. Sekkal

Etude des Transformations Tribologiques de Surfaces

ou TTS induites par impacts à énergie contrôlée

Ecole Centrale de Lyon

5 Décembre 2000

Jury : Esnouf Claude (Pdt) - Gaffet Eric (rapp.) - Georges Jean Marie (Rapp.) - Inglebert Geneviève Langlade-Bomba Cécile
- Lucuru Daniel - Vannes A. Bernard

N. LORRAIN

Poudres Nanocomposites Ag - SnO₂ préparées par broyage réactif : mise en oeuvre, frittage et évolution microstructurale

30 Octobre 2000 - Université de Grenoble I

Jury : E. Gaffet (Rapp.), F. Thévenot (Rapp.), D. Bouvard, G. Le Caër, C. Carry (Dir. Thèse), L. Chaffron

J.Ph. BRAGANTI

Synthèse d'alliages amorphes Al-Ni-Zr par broyage mécanique :

- étude de la cinétique de cristallisation par calorimétrie,

- analyse du chemin réactionnel par diffraction des rayons X

20 octobre 2000 – Université Henri Poincaré – Nancy I – Vandoeuvre lès Nancy

Jury : C. Bergman (Rapp.), J.P. Bros (Rapp.), J.M. Moreau, S. Colin-Bégin, J.C. Gachon, F.A. Kuhnast (Dir)

M. Nakhl

Le broyage énergétique appliqué à :

l'obtention de mélanges composites à base de magnésium utilisables pour le stockage de l'hydrogène,
la modification des propriétés magnétiques d'intermétalliques à base de gadolinium

16 Octobre 2000 - Université de Bordeaux I - Bordeaux

Jury : G. Le Caër (Rapp.), E. Gaffet (Rapp.), B. Chevalier, J.-L. Bobet, J. Etourneau

Ch. Gras

Réactivité et Thermodynamique dans le procédé MASHS

(Mechanically Activated Self - Propagating High - Temperature Synthesis) :

Application aux systèmes Mo / Si et Fe / Si

6 Septembre 2000 - Univ. de Bourgogne - Dijon

Jury : Y. Bienvenu (Rapp.), G. Le Caer (Rapp.), G. Bertrand, JP Bonnet, M. Gailhanou, JP Larpin,
F. Bernard (Co - directeur) & E. Gaffet (Co - Directeur)

M. Zouggar

"Effets du broyage sur les propriétés structurales et mécaniques de poudres de fer pur et sur l'activation de la nitruration"

4 Septembre 2000 - LMP - Poitiers

Jury : A. Fnidiki(Rapp.), E. Gaffet (Rapp), P. Goudeau (Inv.), M. Grosbras (Inv.), A. Straboni ,
P. Chartier (Co - Dir) & J. Mimault (Co - Dir)

C. Goujon

"Elaboration par cryobroyage et métallurgie des poudres de nanocomposites à matrice d'alliage d'aluminium renforcée par des particules de nitrure d'aluminium"

25 Mai 2000 - ENSMSE

Jury : P. Goeriot (Dir. Thèse), G. Le Caer (Rapp.), D. Michel (Rapp.), F. Bernard, Y. Laurent, M. Suery,
F. Thévenot, S. Vicens

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)

Structure 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,(Rapporteur) - F. NARDOU (Rapporteur), D. VREL, M.F. BEAUFORT, M. GROSBRAS, J. MIMAUT(Directeur de Thèse)

Hugues GUÉRAULT

PROPRIÉTÉS STRUCTURALES ET MAGNÉTIQUES DE POUDRES DE FLUORURES NANOSTRUCTURÉES MF₃
(M=Fe, Ga)

OBTENUES PAR BROUYAGE MÉCANIQUE

28 Janvier 2000

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

Jury : Gérard Le CAER,(Rapporteur), Marc NOGUES, (Rapporteur), Jean-François BÉRAR, Frédéric BERNARD, , Jean-Yves BUZARÉ, , Marc LEBLANC, Jean-Marc GRENÈCHE (Directeur de thèse)

Cyril Lenain

APPLICATION DE LA MECANOCHIMIE A LA PREPARATION D'ALLIAGES HYDRURABLES NANOCRISTALLINS
AB₅, MG-NI, AB₂ (M) ET DE COMPOSITES M-C, M-Cu : ETUDE DE LEURS PROPRIETES ELECTROCHIMIQUES.

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

Jury : J. Etourneau, M. D. Fruchart, A. Percheron - Guegan, L. Schlapbach, J-M. Tarascon, M. L. Aymard

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 : 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 Mechanosynthesis Group.

**Job Vacancies, Ph D Position and Post Doc Position
Requests – Proposals**

From B. Mhohamed – UK – (10/01/2001)

Marie Curie Training Fellowships

Applications are invited for 3-12 month research fellowships supported by the Marie Curie Training Sites scheme. The successful candidates will be involved with the processing of alloys, intermetallics, nanostructures, or composites for high-temperature, biomedical and/or energy-storage applications. Processing techniques and facilities include ball milling, mechanical alloying, reaction synthesis, tape casting, slurry powder metallurgy, and vacuum cold/hot pressing. Materials characterisation will be carried out by TG/DTA, DSC, MS, optical microscopy, X-Ray, and SEM/TEM techniques. Complementary modelling activities for materials-design, processing, microstructural evolution, and/or property predictions may also be involved as part of the fellowship training programme. Modelling methodologies range from *ab initio* atomistic simulations to finite-element methods. The candidates must satisfy the basic criteria of the training scheme as outlined under <http://www.cordis.lu/improving>. As the fellowship forms part of a higher degree project, the candidates should be a registered full-time PhD research student in a well-recognised institution, working on materials synthesis, characterisation, and/or computer modelling of materials, of an EU nationality (non-UK) and under 35 years of age. Deadline for application: 30 February 2001.

For further details, please contact: Professor Z. Xiao Guo, phone: 0044-20-7882-5569; e-mail: x.guo@qmw.ac.uk; or visiting: <http://www.metallicmaterials.com/>.

QMW / University of London is an equal opportunity employer.

From A.R. Yavari - France (8/01/2001)

EU Postdoc/Ph.D. positions in fields of Nanostructured Materials and Bulk

Metallic Glasses are available immediately in France and several other EU

States. Please check the following web page

<http://www.inpg.fr/BMG-RTN/>

and contact the Coordinator A.R. Yavari at <mailto:euronano@ltpcm.inpg.fr>

From Dr. Jürgen Eckert Allemagbe (11/2000)

Ph D or Post Doc Position

We are looking for a PhD candidate / Postdoc to start as soon as possible in the framework of an European RTN network on bulk metallic glasses and nanostructured materials.

Dr. Jürgen Eckert

IFW Dresden - Institut für Metallische Werkstoffe

Postfach 27 00 16 - D-01171 Dresden -Germany

>Tel.: +49 (351) 4659-602/-324

>Fax: +49 (351) 4659-541

>E-mail: <mailto:j.eckert@ifw-dresden.de>

Espagne (25/09/2000) POSTDOCTORAL POSITION (From M.D. Baro)

Universitat Autònoma de Barcelona

The Group de Física de Materials II of the Physics Department of the UAB announces the availability of a 18 months full-time Postdoctoral Research position. Applicants should hold a PhD degree in Materials Science, Physics or in a related field. The position requires:

Knowledge of glasses, metastable and nanocrystalline materials.

Fundamental understanding of the nucleation and crystal growth theories.

Knowledge of calorimetry and thermostability.

Experience in electron, optical and x-ray based characterisation techniques and practices.

Computer literacy.

Citizenship of EU (except Spain) or Associated states.

Under 35 years old.

Proficient level of English

The position begins with effect from January 2001. The research programme includes a close co-operation with other partners of the Project. Applicants should submit a CV, and a statement describing your interest in the position with two references to:

Professor M.D. Baro,

Dept. Physics, Edifici Cc,

08193 Bellaterra, Barcelona, Spain; Tel: 34 93 5811657. Electronic applications can be sent to <mailto:dolors.baro@uab.es>"

Angleterre (21/09/2000) - From Paul Warren (paul.warren@materials.oxford.ac.uk)

Job vacancies in a Research Training Network.

Research Training Network on Manufacture and Characterisation of Nanostructured Al alloys

Pre-doctoral/post-doctoral researchers required at 9 institutions across Europe.

The research positions will involve aspects of : materials processing by gas atomization, rapid solidification and mechanical alloying, followed by compaction; microstructural and microchemical characterisation by XRD, DSC, TEM, STEM, APFIM ; thermodynamic / kinetic modelling and molecular dynamic simulation ; mechanical property evaluation by tensile testing, fatigue testing and high strain rate impact testing.

See Network Homepage <http://www.materials.ox.ac.uk/nano-al/> for more details.

Bibliographie Récente

Livres ou "Special Issues"

(11/2000) Information from Fritsch (A. Kohler)

The subject of the sixth forum part Fritsch Forum Part VI scheduled for September 14/15th, 2000, will be "high-energy fine grinding". Research and Development demand general-purpose grinding processes which simultaneously exactly define the required energy and the type of stress. This is the only way that reliable results can be achieved when determining activation energies or the mechanical alloying. It must be possible to reproducibly adjust all of the grinding parameters affecting the grinding results.

Participants from research, development and industry will report on demands and novel technological solutions in developing innovative milling technologies. One of the highlights of the event will be FRITSCH's new Vario-planetary mill "pulverisette 4". This planetary ball mill can simulate ball mills of conventional construction, precisely copy the types of stresses that occur there, and thus reproduce or optimise grinding processes. Due to the great flexibility when selecting the grinding parameters, it is possible to produce results that are unattainable with other ball mills. It is the ideal mill for mechanical activation and alloying. The main applications are in the area of material research and naturally wherever a powerful, innovative laboratory planetary mill is needed.

An extensive report has been written about this event which details and makes readily available the relevant parts of the lectures and the extensive results of the discussions. Anyone interested can request a copy of the complete report for this forum part VI event on the topic "high-energy fine grinding". Please contact Andrea Köhler, FRITSCH GMBH, Industriestrasse 8, D-55743 Idar-Oberstein, (Phone: 0049/6784/7046, E-Mail: koehler@fritsch.de)

(7/07/2000) - From Victor Rieckansky Publisher

Cambridge International Science Publishing <http://www.demon.co.uk/cambsci/homepage.htm>

MACROMOLECULAR MECHANOCHEMISTRY

Volume 1: Polymer Mechanochemistry - by Cleopatra Vasiliu OPREA & Florin DAN

Department of Macromolecules, Gh. Asachi, Technical University, 6600 Iasi, Romania

Macromolecular Mechanochemistry presents from theoretical and experimental point of view the main problems of this field, including the results obtained in more than a century of research. It is organised in two volumes: Polymer Mechanochemistry and Polymers with Chemomechanical Functions, respectively. The present volume deals with: Chained Polystage Character of Mechanochemical Process (1), Mechanochemistry of Polymers Deformation (2); Mechanochemistry of Polymer Fracture (including also the Fracture of Composite Materials) (3), and Mechanochemical Processes for Energy Conversion (4). In this frame, the theoretical and experimental material is organised in correlation to the reaction mechanism, the type of mechanical solicitation, and the nature of environmental medium. This book is addressed to professors, students, and researchers involved in the field of polymer science, to engineers from the industry of synthesis and processing of plastic materials, elastomers and fibres, as well as to specialists from all technical domains that exploit polymer-based materials. They will find in the book examination of the theoretical, experimental and applied problems and wide access to the basic literature in this field. Contents

1. Chained polystage mechanism of mechanochemical processes
2. Mechanochemistry of polymers deformation
3. Mechanochemistry of Polymer Fracture
4. Mechanochemical Processes for Energy Conversion

Volume 1 (ISBN 189832672X) will be published in September 2000, approx. 500 pages, cased, approximate price £80.00; (volume 2 will be published at the end of - 2000)

Send your preliminary order to <mailto:orders@cisp.demon.co.uk>

(9/06/2000)

"Mechanical Alloying : FABRICATION OF ADVANCED MATERIALS AT ROOM TEMPERATURE" by M. Sherif El-Eskandarany

(ISBN: 977-299-089-7) Published by DAR AL-FIKR AL-ARABI, Cairo-Egypt.

The price of the book is \$50, and a special discount (20%) is offered to all the RFM member.

Preface

Mechanical alloying (MA) process using ball-milling and/or rod-milling techniques, has received much attention as a powerful tool for fabrication of several advanced materials, including equilibrium, nonequilibrium (e.g., amorphous, quasicrystals, nanocrystalline, etc.), and composite materials. In addition, it has been employed for reducing some metallic oxides by milling the oxide powders with metallic reducing agents at room temperature. The MA is unique process in that a solid state reaction takes place between the fresh powder surfaces of the reactant materials at room temperature. Consequently, it can be used to produce alloys and compounds that are difficult or impossible to be obtained by the conventional melting and casting techniques.

This book intended primarily to serve as an introduction to the MA process, including general description of the process, starting material requirements, the equipment, characterizations of the milled powders, and consolidation techniques, which used to compact the powder into fully-dense bulk materials.

The book contains several typical examples of selected advanced materials that have been fabricated by MA. This book is aimed at either senior undergraduate/post graduate students or materials scientists/metallurgists. - M. Sherif El-Eskandarany - April 2000 - Cairo - Egypt

Contents

Introduction - Background - History of Mechanical Alloying - Milling - Factors Affecting the Mechanical Alloying 8 - Types of Mills 8 - High Energy Ball mill 9 - Attritor Ball Mill 9 - Planetary Ball Mill 11 - Vibratory Ball Mill 12 - Low Energy Ball Mill 15 - Tumbler Ball Mill 15 - Tumbler Rod Mill 16 - Effect of Ball-to-Powder Weight Ratio 19 - Effect of Milling Atmosphere 22 - Mechanism of Mechanical Alloying 23 - Ball-Powder-Ball Collision 24 - Necessity of Mechanical Alloying 25 - References 27

PART I GRAIN REFINING, SIZE CONTROLLING AND HOMOGENIZATION

Fabrication of ODS Alloys - Introduction and Background - Applications and Examples - ODS Ni-Base Superalloys and Fe-Base High Temperature Alloys 34 - INCONEL MA 754 35 - INCONEL MA 6000 37 - INCOLOY MA 956 38 - ODS Al Base Alloys 38 - References 45 - Fabrication of Nanophase Materials - Introduction - Influence of Nanocrystalline on the Mechanical Properties: Strengthening by the Grain size Reduction - Formation of Nanocrystalline Materials by Ball Milling Technique - Mechanism(s) 52 - Selected Examples 53 - Formation of Nanocrystalline Ni_xMo_{100-x} 53 - Formation of Nanocrystalline FCC Metals 54 - Consolidation of the Nanocrystalline Milled Powders - References 59 - Fabrication of Nanocomposite Materials - Introduction and Background - Fabrication of SiCp/Al Composites by Mechanical Alloying - Properties of Mechanically Solid State Fabricated SiCp/Al Composites - Mechanism of Fabrication - References 82

PART II ROOM TEMPERATURE REACTIVE MILLING

Mechanically Induced Solid-State Carbonization - Introduction - Difficulties of Preparations - Fabrication of Nanocrystalline TiC by Mechanical Alloying Method - Properties of Mechanically Solid State Reacted TiC Powders - Other Carbides Produced by Mechanical Alloying - References 124 - Mechanically Induced Solid-Gas Reaction - Introduction - Fabrication of Nanocrystalline TiN by Reactive Ball milling - Properties of Reacted Ball Milled TiN Powders - Mechanism of Fabrication - Other Nitrides Produced by RBM - Fabrication of Nanocrystalline Solid Solution NiTiH by Reactive Ball Milling - References 157 - Mechanically Induced Solid-State Reduction - Introduction - Reduction of Cu₂O with Ti by Room Temperature Rod Milling - Properties of Rod-Milled Powders - Mechanism of MSSR - Fabrication of Nanocrystalline WC and Nanocomposite WC-MgO Refractory Materials by MSSR and Methods - References 189 - Mechanically Induced Solid-State Amorphi Applications - Amorphous Austenitic Stainless Steel 254 - Fabrication of amorphous Fe₅₂Nb₄₈ Special Steel 257 - Fe-Zr-B 259 - Difference between Mechanical Alloying and Mechanical Disordering in the Amorphization Reaction of Al₅₀Ta₅₀ in a Rod Mill - Mechanically Induced Cyclic Crystalline-Amorphous Transformations During Mechanical Alloying - References 295 -

(05/05/2000)

Extractive Metallurgy of Activated Minerals

included in series Process Metallurgy, 10

by P. Balaz - Institute of Geotechnics, Slovak Academy of Sciences

ISBN : 0 - 444 - 50206 - 8 / Price USD 144, Euro 124.79)

[file://http // www.elsevier.nl/inca/publication](http://www.elsevier.nl/inca/publication)

Description

Mechanical activation of solids is a part mechanochemistry, the science with a sound theoretical foundation exhibiting a wide range of potential application. Mechanical activation itself is an innovative procedure where an improvement in technological processes can be attained via a combination of new surface area and defects formation in minerals.

Mechanical activation is of exceptional importance in extractive metallurgy and mineral processing and this area forms the topic of this book and is a result of more than twenty years of research and graduate teaching in the field.

In pyrometallurgy, the mechanical activation of minerals makes it possible to reduce their decomposition temperatures or causes such a degree of disordering that the thermal activation may be omitted entirely. The potential mitigation of environmental pollutants is becoming increasingly important in this context.

The lowering of reaction temperatures, the increase of the rate and amount of solubility, preparation of water soluble compounds, the necessity for simpler and less expensive reactors and shorter reaction times are some of the advantages of mechanical activation in hydrometallurgy. The environmental aspects of these processes are particularly attractive.

Several industrial processes are examined and the flowsheets are presented as successful of activation. In these processes, the introduction of a mechanical activation step into the technological cycle significantly modifies the subsequent steps.

The book is designed for researchers, teachers, operators and students in the areas of extractive metallurgy, mineral processing, mineralogy, solid state chemistry and materials science. It will encourage newcomers to the mechanochemistry to do useful research and discover novel applications in this field.

(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 234x156 mm, cased, £45.00, 1999

DISPERSION STRENGTHENED ALUMINIUM PREPARED BY MECHANICAL ALLOYING, by M Besterci -

<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 : <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.sciencenet.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-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)

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 à lancer 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, (.....)

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

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

Périodiques

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

[27] STUDY OF THE TRIBOLOGICALLY TRANSFORMED STRUCTURE CREATED DURING FRETTING TESTS

Sauger E. Ponsonnet L. Martin JM. Vincent L. - Tribology International. 33(11):743-750, 2000

In fretting, without a lubricant, structures fail through wear involving debris. Various metallographic assessments show that this debris creation derives from a special structure, hereafter called the "tribologically transformed structure" (TTS). The latter is nucleated at the very beginning of a contact's life, and eventually masks the initial material's tribological behaviour. This TTS is very hard and brittle, and is quickly destroyed, which explains why TTS is rather difficult to observe. This study focuses on initiation mechanisms which, up to now, are still highly controversial. Large amounts of TTS are observed after fretting tests, which is the reason why they were chosen as the means of investigation. In this paper, the various possible creation mechanisms for TTS will be analysed. From this overview, two nucleation models are chosen: one is based on "mechanical alloying" considerations, and the other is linked to high-strain-recrystallisation phenomena. Transmission electron microscopy (TEM) investigations are used to check these assumptions

[26] ON THE TIME SCALE OF THE AMORPHIZATION REACTION IN HF63PD37 SYSTEM PREPARED BY MECHANICAL ALLOYING

Al-Hajry A. - Physics of Low-Dimensional Structures. 7-8:27-36, 2000

The time scale of the amorphization reaction in HfPd system prepared by mechanical alloying (MA) technique was investigated. X-ray diffraction and differential scanning calorimetry (DSC) were used to study the structural transformations and stability of this system. A direct transformation from crystalline to amorphous phase was observed. The intensity of the crystalline peaks of both the hexagonal Hf and cubic Pd phases decayed exponentially as a function of the milling time. The time constants of the decaying process were obtained. On an atomic scale, the radial distribution function RDF(r) and the thermal behavior of the MA Hf63Pd37 (milled for 6 h) showed that it is of a single amorphous phase

[25] NEUTRON DIFFRACTION AND PHASE EVOLUTION OF THE MECHANICALLY ALLOYED INTERMETALLIC COMPOUND ZETA-FeZn13

Uwakweh ONC. Liu ZT. Jordan A. Chakoumakos B. Spooner S. Maziasz P. - Metallurgical & Materials Transactions A-Physical Metallurgy & Materials Science. 31(11):2739-2745,

High-energy ball milling with subsequent annealing is used to synthesize the intermetallic compound zeta -FeZn13. The mechanically alloyed phase in the as-milled state is determined to be nonequilibrium, or metastable. Transmission electron microscopy (TEM) studies show a highly defective microstructure with undefined grain areas, and the alloy can be described as a mechanical mixture of elemental Fe and Zn, based on neutron diffraction measurements. Characteristic stages associated with its transformation to the equilibrium state are identified based on differential scanning calorimetry (DSC) measurements. The activation energies corresponding to these stages are 128, 202, and 737 kJ/mole, respectively, with increasing transformation temperatures. The first stage is related to limited atomic diffusion or rearrangements, such as recovery, during thermal treatment, while the second stage depicts continued recrystallization and long-range atomic diffusion leading to a stable phase formation. The third and final stage marks structural decomposition of the equilibrium structure due to phase transition. Neutron diffraction of the equilibrium alloy confirmed that the structure is C2/m, with lattice parameters of $a = 13.40995$ Angstrom, $b = 7.60586$ Angstrom, $c = 5.07629$ Angstrom, and $\beta = 127$ deg 18 minutes. The atomic positions of Fe and Zn compared well to reported values

[24] THERMAL TRANSFORMATIONS IN MECHANICALLY ALLOYED FE-ZN-SI MATERIALS

Uwakweh O. Jordan A. Maziasz P. - Metallurgical & Materials Transactions A-Physical Metallurgy & Materials Science. 31(11):2747-2754,

The ball milling of elemental powders corresponding to Gamma (Fe₃Zn₁₀) + 0.12 wt pet Si; Gamma (1) (Fe₅Zn₂₁) + 0.12 wt pet Si; delta (FeZn₇) + 0.12 wt pet Si; and zeta (FeZn₁₃) + 0.12 wt pet Si composition ratios yields crystalline, mechanically alloyed phases. Differential scanning calorimetry (DSC) measurements of these materials show that they evolve differently, with well-defined characteristic stages. The activation energies for processes corresponding to these stages, based on kinetic analyses, are determined and correlated to microstructural evolutions. The processes occurring during the first stage below 250 degreesC, for all of the materials studied using X-ray diffraction (XRD) analysis, are associated with release of strain, recovery, and limited atomic diffusion. The activation energies for recovery processes are 120 kJ/mole for the Gamma + 0.12 wt pet Si, 131 kJ/mole for delta + 0.12 wt pet Si, and 96 kJ/mole for zeta + 0.12 wt pet Si alloys. At higher temperatures, recrystallization and other structural transformations occur with activation energies of 130 and 278 kJ/mole for Gamma + 0.12 wt % Si; of 161 kJ/mole for Gamma (1) + 0.12 wt pet Si; of 167 and 244 kJ/mole for delta + 0.12 wt pet Si; and of 641 kJ/mole for the zeta + 0.12 wt pet Si. In addition, a eutectic reaction at 420 degreesC +/- 3 degreesC, corresponding to the Zn-Si system, and a melting of Zn in Fe-Zn systems are observed for the zeta + 0.12 wt pet Si material. The relation of FeSi formation in the Sandelin process is discussed

[23] MECHANICAL ALLOYING OF CO-CU POWDERS

Garcia-Pacheco G. Cabanas G. Lopez-Cajun CS. Herrera A. Castano V. - Materials Research Innovations. 3(6):332-339, 2000

The aim of this work was to investigate two cobalt alloys, namely, the Co-20Cu and the Co-30Cr (atomic percentage), prepared by mechanical alloying, by using balls and Szegvari mills. The samples obtained were characterized by X-ray diffraction, differential scanning calorimetry, and chemical microanalysis. The main results for the Co-20Cu show a good agreement with previous work in terms of the corresponding lattice parameters values which are function of milling times. The milled mixtures show a nodular morphology. For the Co-30Cr, difference in X-ray patterns from the final samples were found as compared to other works. The particle size of the powders plays an important role in the alloys preparation

[22] MECHANOCHEMICAL ACTIVATION OF IRON ORE-BASED CATALYSTS FOR THE HYDROGENATION OF BROWN COAL

Kuznetsov PN. Kuznetsova LI. Chumakov VG. Moiseeva GA. - Materials Research Innovations. 3(6):340-346,

Genesis of pyrrhotite catalysts from different iron ore concentrates and pure iron oxides was investigated using the method of mechanochemical treatment in a planetary mill. The dispersion and fine crystalline structure of oxide and pyrrhotite particles

were studied as the function of mechanical load, sulfiding temperature and mode of preparation. Methods for the preparation of high performance iron ore-based catalysts for brown coal hydrogenation have been developed

[21] HIGHLY ENHANCED SINTERABILITY OF COMMERCIAL PZT POWDERS BY HIGH-ENERGY BALL MILLING

Kong LB. Ma J. Zhu W. Tan OK. - *Materials Letters*. 46(5):274-280,

High-energy ball milling technique was successfully applied to a commercial lead zirconate titanate (PZT) powder to decrease its sintering temperature by 100 degreesC. The sinterability enhancement of commercial PZT powder through this technique was evidenced by experimental results. The commercial PZT powder is made up of ball-shaped particles of tens of micrometers in size, consisting of $< \mu >$ m grains. After ball milling for 10 h, the large particles were totally broken down and the grain size was reduced by two orders of magnitude. The milled PZT powder achieves its maximum sintering rate at about 800 degreesC, while the sintering rate peak for unmilled powder is about 1150 degreesC. Almost fully dense PZT ceramics, which show good dielectric and ferroelectric properties, can be achieved by sintering the milled powder at temperature as low as 950 degreesC. On the other hand, the unmilled powder still exhibits porous structure after being sintered at 1000 degreesC and shows very high dielectric loss and loose P-E hysteresis loop. It can be concluded that high-energy ball milling is an effective technique to improve the sinterability of commercially available PZT powders and may be also applied to other materials.

[20] SYNTHESIS OF BARIUM TITANATE IMPROVED BY MODIFICATIONS IN THE KINETICS OF THE SOLID STATE REACTION

Brzozowski E. Castro MS. - *Journal of the European Ceramic Society*. 20(14-15):2347-2351,

In this work, the synthesis of BaTiO₃ powder from BaCO₃-TiO₂ reaction at high temperatures is studied. In order to improve the kinetics of this reaction, successive modifications on the powder processing have been implemented. The contribution of the mechanochemical activation to the BaTiO₃ formation is analysed. It was found that the use of a mechanochemical activation favours the decomposition of BaCO₃ at low temperatures and improves the barium ion diffusion through the BaTiO₃ layer. In consequence, a BaTiO₃ product free of secondary phases can be obtained at lower temperatures

[19] FORMATION PROCESS OF 60LI(2)S CENTER DOT 40SiS(2) AMORPHOUS MATERIALS WITH HIGH LITHIUM ION CONDUCTIVITY PREPARED BY MECHANICAL MILLING

Yamashita H. Hayashi A. Morimoto H. Tatsumisago M. Minami T. Miura Y. - *Nippon Seramikkusu Kyokai Gakujutsu Ronbunshi-Journal of the Ceramic Society of Japan*. 108(11):973-978,

The formation process of 60Li(2)S.40SiS(2) lithium ion conducting materials prepared by mechanical milling was investigated by X-ray diffraction (XRD), Si-29 magic angle spinning nuclear magnetic resonance (MAS NMR), X-ray photoelectron spectroscopy (XPS), and scanning electron microscope (SEM) observation. Upon mechanical milling for only 1h most SiS₂ particles reacted with Li₂S crystals to form partially amorphous materials. Such material reacted with the residual Li₂S crystals by further mechanical milling treatments, until the composition of the amorphous part became the nominal one. Since the fully amorphous part became dominant in a continuously percolated structure, the ion conductivity could be greatly improved from 10(-10) to 10(-4) S.cm(-1) at room temperature

[18] STRUCTURAL TRANSFORMATION WITH MILLING ON SOL-GEL PRECURSOR FOR BAM HEXAFERRITE

Rams EE. Garcia RM. Reguera E. Sanchez HM. Madeira HY. - *Journal of Physics D-Applied Physics*. 33(21):2708-2715,

The structural modification upon milling in an intermediate step precursor of the sol-gel method for BaFe₁₂O₁₉ hexaferrite BaM production is discussed. The milling of the precursor diminishes the powder particle size, leads to a more homogeneous matrix and induces a solid-state transformation, from gamma -Fe₂O₃ to alpha -Fe₂O₃. The induced modifications of the precursors change the magnetic and structural properties of the final BaM hexaferrite compared to the BaM obtained from the non-milled precursor

[17] IMPROVEMENT OF THE HIGH ENERGY BALL-MILLING PREPARATION PROCEDURE OF CO TOLERANT Pt AND Ru CONTAINING CATALYSTS FOR POLYMER ELECTROLYTE FUEL CELLS

Denis MC. Gouerec P. Guay D. Dodelet JP. Lalande G. Schulz R. - *Journal of Applied Electrochemistry*. 30(11):1243-1253,

Ball-milling has been used to prepare performing CO tolerant polymer electrolyte fuel cell anode catalysts that contain Pt and Ru. The catalyst precursors are obtained by milling together Pt, Ru and a dispersing agent in the atomic ratio 0.5, 0.5 and 4.0. This precursor is not easily recovered after milling because it sticks to the walls of the vial and on the grinding balls. However, the precursor is recovered as a powder when a process control agent (PCA) is added during the milling step. Various PCAs have been used. The PCA should not interfere with the electrocatalytic activity of the catalysts obtained by leaching the precursor. The best preparation of catalyst precursors are obtained by milling: (i) Pt, Ru and Al (dispersing agent) in the atomic ratio 0.5, 0.5, 4.0 + 10 wt% NaF (PCA) or (ii) Pt, Ru and MgH₂ in the 0.5, 0.5, 4.0 atomic or molecular ratio. In this case, MgH₂ plays at the same time the role of a dispersing agent and that of a PCA. The catalysts are obtained by leaching Al and NaF in (i) or MgH₂ in (ii). The CO tolerance of these catalysts is equivalent to that of Pt_{0.5}Ru_{0.5} Black from Johnson Matthey. The ball-milled catalysts have a surface area comprised between 30 and 44 m² g⁻¹. As-prepared catalysts are mainly made of metallic Pt and metallic plus oxidized Ru. After fuel cell tests, Pt is completely metallic while the oxidized Ru content decreases but does not disappear. These catalysts are composed of particles with crystallites of two different sizes: in (i) nanocrystallites (similar to 4 nm) that contain essentially Pt alloyed with Al and perhaps some Ru, and larger (greater than or equal to similar to 30 nm) crystallites that contain essentially Ru; in (ii) Pt nanocrystalline particles that may contain some Ru and larger particles that contain essentially either Ru or Pt

[16] DEHYDROGENATION PROPERTIES OF NANO-/AMORPHOUS Mg₂NiH_x BY HYDROGEN INDUCED MECHANICAL ALLOYING

Hong TW. Kim SK. Kim YJ. - *Journal of Alloys & Compounds*. 312(1-2):60-67, 20000

In recent years, nanocrystalline materials have been of interest for hydrogen storage applications. Especially, the great improvement of the hydrogenation properties of Mg alloys that can be achieved by nanocrystallization. In this study, nanocrystalline Mg₂NiH_x is fabricated from Mg and Ni chips by hydrogen induced mechanical alloying (MA) for 96 h under a high-pressure hydrogen atmosphere. The balls to chips mass ratios (BCR) are 30:1 and 66:1. The particles obtained are characterized by XRD and TEM, and absorbed hydrogen contents (AHC) were measured by TGA. For dehydrogenation kinetics, activation energies are calculated by isothermal thermogravimetry analysis (ITGA) and pressure-composition-isotherm (PCI) analysis. The results of XRD and TEM revealed that the Mg₂NiH_x peaks are broadened in the case of high BCR and the particles are composed of the nanocrystalline phases less than 10 nm with the amorphous phase. The results of ITGA and PCI analysis show that the dehydrogenation kinetics are greatly improved by nanocrystallization. The results show

that BCR conditions mainly affect the size and fraction of the nanocrystalline phases, the resultant AHC and the dehydrogenation kinesiopes

[15] THE EFFECT OF TERNARY ADDITION ON THE FORMATION AND THE THERMAL STABILITY OF L1(2) AL3ZR ALLOY WITH NANOCRYSTALLINE STRUCTURE BY MECHANICAL ALLOYING

Moon KI. Chang KY. Lee KS. - Journal of Alloys & Compounds. 312(1-2):273-283, 2000

We have tried to produce nanocrystalline L1(1) Al+25 at.% Zr+12.5 at.% M (M=Cu, Ni, Mn) alloys by planetary ball milling of elemental powders. Systematic studies on ternary addition on the formation and the thermal stability of metastable L1(2) phase are also given in this study. L1(2) Al3Zr alloy was effectively prepared by mechanical alloying of elemental powders of Al and Zr for 3 h. In the case of ternary addition the L1(2) phase was formed after 6-h milling for Cu and 3-h milling for Ni. In Mn addition, the L1(2) phase was formed after 3 h and transformed into an amorphous phase after 6 h. The as-milled L1(2) Al3Zr and L1(2) Al5Zr2Cu alloy powder had nanocrystalline structures with grain sizes less than 10 nm. L1(2) Al3Zr alloy transformed into stable D0(23) phase at 625 degreesC. L1(2) phase has been stabilized significantly by ternary addition up to over 900 degreesC for Cu and 850 degreesC for Ni, respectively. Amorphous Mn added to Al3Zr alloy crystallized to L1(2) phase at 770 degreesC and the crystallized L1(2) phase was stable up to over 900 degreesC. The nanocrystalline structure was maintained after 20-min heat treatment at 900 degreesC

[14] SYNTHESIS AND CHARACTERIZATIONS OF BALL-MILLED NANOCRYSTALLINE WC AND NANOCOMPOSITE WC-CO POWDERS AND SUBSEQUENT CONSOLIDATIONS

El-Eskandarany MS. Mahday AA. Ahmed HA. Amer AH. - Journal of Alloys & Compounds. 312(1-2):315-325, 2000

The room-temperature ball-milling technique has been successfully employed for fabrication of nanocrystalline powders of equiatomic WC by high-energy ball milling of elemental W and C powders. The progress of the solid state reaction has been monitored by means of X-ray diffraction, scanning electron microscopy and transmission electron microscopy (TEM). A complete single phase of hcp-WC was obtained after 295 ks of milling. Increasing the milling time to 432 ks leads to dramatic grain refinement and the powder of this end-product consists of nanocrystalline grains of less than 5 nm in diameter. The fabricated WC 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 µm in diameter). Part of the powders of the end-product were further ball-milled, 259 ks together with different concentrations of metallic Co to obtain spherical fine nanocomposite WC-coated Co powders with an average particle size of less than 5 µm in diameter. Both WC free Co and composite WC-Co powders were then consolidated into fully dense (>99.5%) compacts using cold and hot pressing techniques. The as-consolidated samples still maintained their nanocrystalline characteristics with an average grain size of less than 100 nm. Some of physical and mechanical properties of the consolidated samples are reported

[13] THERMOELECTRIC PROPERTIES OF N-TYPE (Bi2Se3)(X)(Bi2Te3)(1-X) PREPARED BY BULK MECHANICAL ALLOYING AND HOT PRESSING

Yang JY. Aizawa T. Yamamoto A. Ohta T. - Journal of Alloys & Compounds. 312(1-2):326-330,

Starting from element Bi, Se and Te granules, n-type (Bi2Se3)(x)(Bi2Te3)(1-x) with different chemical composition (x=0.025, 0.05, 0.075, 0.10 and 0.15) were prepared via bulk mechanical alloying (BMA) and hot pressing (PIP). Effects of chemical composition, doping content and annealing on thermoelectric properties were reported. The range x less than or equal to 0.050 is more favorable than other chemical compositions for the thermoelectric properties of BMAed (Bi2Se3)(x)(Bi2Te3)(1-x). When doping with SbI3, both the electrical resistivity and the Seebeck coefficient of (Bi2Se3)(0.05)(Bi2Te3)(0.95) decrease, thus resulting in no improvement of the figure of merit. On the other hand, annealing the as-HPed (Bi2Se3)(0.05)(Bi2Te3)(0.95) a sufficiently long time is helpful to improve thermoelectric properties, and the maximum figure of merit of (Bi2Se3)(0.05)(Bi2Te3)(0.95) is $2.31 \times 10^{-3}/K$

[12] HYPERFINE INTERACTIONS IN SOLID STATE REACTION OF HEMATITE WITH ALUMINIUM

Jartych E. Oleszak D. Zurawicz JK. - Hyperfine Interactions. 128(4):495-501, 2000

The solid state reaction of hematite with aluminium has been induced by mechanical alloying. Mossbauer spectroscopy and X-ray diffraction have been used to investigate the reaction products. The reaction was completed in a time longer than 15 min but shorter than 30 min. During the reaction a Fe(Al) bcc solid solution was obtained as a matrix, with Al2O3 as reinforcement. After prolonged milling both components were in a nanocrystalline paramagnetic state

[11] MOSSBAUER SPECTROSCOPY AND X-RAY DIFFRACTION STUDY OF FexMn0.70-xAl0.30 (0.40 < X < 0.70) ALLOYS PREPARED BY MECHANICAL ALLOYING

Castro MMR. Barreto MHM. Alcazar GAP. - Hyperfine Interactions. 128(4):503-510, 2000

In order to study the structural and magnetic behaviour of FexMn0.70-xAl0.30 (0.40 less than or equal to x less than or equal to 0.70) alloys prepared by mechanical alloying, Mossbauer spectroscopy and X-ray diffraction techniques have been employed. All the alloys were prepared in 24 h and, in addition, for x=0.45 milling times of 4, 8, 12, 16 and 24 h were considered. X-ray diffraction showed that all samples exhibit bcc-type reflections. A slight decrease in grain size and a slight increase in lattice parameter with increasing Mn content were observed. For x=0.45, an increase in grain size with milling time has been evidenced. For this composition and 4 h of milling, the more intensive peak (1 1 0) was fitted with three peaks corresponding to that of Mn, Fe and the alloy, respectively. For 12 h milling only bcc peaks of the alloy were obtained. As the Fe concentration was increased beyond x=0.50, a phase change from paramagnetic to ferromagnetic, as well as an increment in the mean hyperfine field with x, was detected. For x=0.45 and 4 h of milling we registered the presence of both a single line, corresponding to the alloy, and a hyperfine field distribution with peaks in 27.5 and 23 T, as well as peaks at lesser fields. These peaks are associated to Fe sites with two or more Al and/or Mn atoms as next neighbours. These results are in agreement with those obtained by X-ray diffraction

[10] THERMAL AND PHASE EVOLUTION OF MECHANOCHEMICAL REACTIONS IN THE AL-FE3O4 SYSTEM

Botta PM. Aglietti EF. Lopez JMP. - Thermochemica Acta. 363(1-2):143-147,

The physicochemical and thermal behavior of mechanochemically activated Al-Fe3O4 mixtures have been studied. The composition and structural changes undergone in the reaction system have been analyzed by DTA and XRD. Experimental evidence indicates that the nature of the products was dependent on the conditions of mechanochemical and thermal treatments. Under adequate experimental conditions, a self-sustained reaction was triggered, with the production of alpha -Fe and alpha -Al2O3 BY varying the treatment parameters, it was possible, through an alternative reaction path, to obtain different products which show interesting properties in their application as functional matériels

[9] FORMATION OF MOLECULAR ALLOYS BY SOLID-STATE VITRIFICATION

Authors Nagahama M. Suga H. Andersson O. - Thermochemica Acta. 363(1-2):165-174,

Formation of a vitreous molecular alloy was observed when a mixture of deoxycholic acid (DCA) and tri-O-methyl-beta -cyclodextrin (TMCD) crystals was subjected to mechanical milling at room temperature. Only a single glass transition temperature T-g, varying with the composition, was observed by DSC. This means that the vitreous state exhibits a single relaxation process as a whole by forming a molecular alloy. The T-g showed a maximum value at the equimolar composition, indicating a strong interaction between the two components. A study of the phase diagram clarified the existence of intermolecular compounds between them. Thermal conductivity of the milled solid of equimolar mixture exhibited a temperature dependence characteristic of glassy materials, p-Terphenyl and tris(hydroxymethyl)aminomethane crystals could not be vitrified. When each of them was milled with DCA or TMCD, vitreous molecular alloys were obtained in a limited composition range. These alloys exhibited also a single T-g and underwent a phase separation on devitrification. Formation of molecular alloys was discussed based on the nature of disorder of the system

[8] METASTABLE PHASES IN RARE-EARTH PERMANENT-MAGNET MATERIALS [REVIEW]

Zhang ZD. Liu W. Liu JP. Sellmyer DJ. - Journal of Physics D-Applied Physics. 33(22):R217-R246,

A comprehensive review is given of recent advances in the study of metastable phases in rare-earth permanent magnets. The relations between the structures of the metastable and equilibrium phases and the transformations from the former to the latter are discussed. The formation of the phases is found to depend on the difference between the symmetries of the metastable and equilibrium phases. The magnetic properties of the metastable-phase rare-earth permanent magnets synthesized by various processes, such as mechanical alloying, mechanical milling, rapid quenching, hydrogenation, disproportionation, desorption and recombination, solid-state reaction, solid-gas reaction, self-flux and sputtering, are compared. The main conclusion of this article is that searching for new metastable phases with high magnetic performance will be one of the most active directions in the research on rare-earth permanent magnets

[7] MECHANICAL DEGRADATION AND MECHANOCHEMICAL COPOLYMERIZATION OF HYDROXYETHYL CELLULOSE

Ni XY. Hu YF. Liu BL. Xu X. - European Polymer Journal. 37(1):201-206,

Ultrasonic degradation of hydroxyethyl cellulose (I-IEC) in aqueous solution was investigated. The degradation rate of this polymer was found to follow the Baramboim kinetic equation. Rate constants and the generating rates of radicals produced by ultrasonic irradiation were calculated, and the results showed their dependence on polymer concentration. Copolymers of methyl methacrylate/HEC and acrylic acid/HEC were prepared by ultrasound-induced polymerization. Biodegradability of the resultant polymers was assessed through enzymatic cellulase degradation tests. The two kinds of copolymers were found to be susceptible to the cellulase degradation

[6] CHANGES IN BETA-SIALON SUSPENSION BEHAVIOUR DUE TO SURFACE OXIDATION, MILLING, SURFACTANT AND SINTERING ADDITIVE

Kudyba-Jansen A. Muurmans M. Almeida M. Laven J. Hintzen HT. Metselaar R. - Ceramics International. 26(8):839-848, 2000

Results of a study of the behaviour of aqueous suspensions of carbothermally prepared beta -sialon are presented. The influence of an oxidation treatment, attrition milling, sintering additive (Y2O3) and addition of a deflocculant (Dolapix CE 64) on the stabilisation behaviour of the suspensions was studied. Obtained results show that the surface properties of beta -sialon particles are affected, as expected, by the oxidation treatment (isoelectric point, pH(iep) approximate to 2.1) and by attrition milling of the power (pH(iep) approximate to 4.6). In the presence of Y2O3 the suspension of beta -sialon becomes less stable (pH(iep) approximate to 3.4), the viscosity is increased and the stable pH range is reduced. This behaviour is explained in terms of surface composition of p-sialon, the solubility of yttria in acidic solution and the possibility of precipitation of yttrium-hydroxy complexes on p-sialon surface at higher pH while increasing the pH. Addition of the deflocculant increases the absolute zeta potential and changes the suspension behaviour from shear thickening to shear thinning. Low viscosity suspensions with 60 wt% beta -sialon and 10 wt% Y2O3 can be prepared at pH > 10, such that they can be used for slip casting

[5] HYDRODYNAMIC ANALYSIS OF CHEMICAL MECHANICAL POLISHING PROCESS

Park SS. Cho CH. Ahn Y - Tribology International. 33(10):723-730,

Chemical Mechanical Polishing (CMP) refers to a material removal process done by rubbing a work piece against a polishing pad under load in the presence of chemically active abrasive containing slurry. The CMP process is a combination of chemical dissolution and mechanical action. The mechanical action of CMP involves hydrodynamic lubrication. The liquid slurry is trapped between the work piece (wafer) and pad (tooling) forming a lubricating film. For the first step to understand the mechanism of the CMP process, hydrodynamic analysis is done with a semiconductor wafer. Slurry pressure distribution, resultant forces and moments acting on the wafer are calculated in typical conditions of the wafer polishing, and then nominal clearance of the slurry film, roll and pitch angles at the steady state are obtained

[4] KINETIC STUDY OF ISOTHERMAL CRYSTALLIZATION IN AMORPHOUS AL33NI16ZR51 PRODUCED BY MECHANICAL ALLOYING

Braganti JP. Held O. Kuhnast FA. Illekova E - Abbreviated Source Thermochim. Acta. 362(1-2):71-78, (2000)

A non-conventional way of production has been chosen to prepare Al33Ni16Zr51 amorphous alloy: mechanical alloying which allowed the microstructure of the material to be monitored. For this type of non-equilibrium alloys, the evolution toward an equilibrium state-and the crystallization kinetics were studied by differential scanning calorimetry. The crystallization processes were interpreted in terms of several theoretical models based on nucleation and growth protestes

[3] A STUDY OF TWO MAGNETIC PHASES IN A CO-CU MAGNETIC GRANULAR ALLOY

Yoo YG. Yu SC. Kim W - Journal of the Korean Physical Society. 37(5 Part 1):565-568, 2000

A magnetic granular Co-Cu alloy was prepared by using the mechanical alloying technique, and the resulting powder was consolidated by hot pressing. The structural evolution and the magnetization behavior were examined by using X-ray diffractometry (XRD) and magnetization measurements made with a vibrating sample and SQUID magnetometer. The XRD results and the variation of the magnetization with processing time showed the formation of a supersaturated fee solid solution. The magnetization of the alloy could be interpreted as a mixture of ferromagnetic and superparamagnetic components, resulting from the non-uniform size distribution of magnetic clusters in the Cu matrix. With increasing temperature, the superparamagnetic component became the dominant contributor. The maximum MR ratio of the hot pressed specimen was about 3.3 % at room temperature under a maximum magnetic field of 10 kOe

[2] EFFECT OF MILLING MEDIA ON THE REACTION KINETICS OF THE MECHANOCHEMICAL SYNTHESIS OF PENTATITANIUM TRISILICIDE

Kudaka K. Iizumi K. Sasaki T. Izumi H. - Journal of the American Ceramic Society. 83(11):2887-2889, 2000

The mechanochemical synthesis of pentatitanium trisilicide (Ti_5Si_3) by the ball-milling of elemental mixed powders using zirconia, stainless steel, and tungsten carbide milling media was performed. These reactions were mechanically induced self-propagating reactions. The induction period during the reaction using zirconia milling media was the shortest among these reactions. Because the thermal conductivity of zirconia is the lowest, it is assumed that the heat produced during milling using the zirconia milling media was effectively stored, and the ignition temperature was attained within the shortest time. The ignition temperature was estimated to be similar to 500 degreesC. The particle size of the Ti_5Si_3 obtained using the tungsten carbide milling media was the finest because of the induction time and specific gravity

[1] FORMATION AND CHARACTERIZATION OF GERMANIUM NANOPARTICLES

Welham NJ. - Journal of Materials Research. 15(11):2400-2407, 2000

Elemental germanium was mechanically milled with magnesium oxide with the intention of forming disperse nanoparticulate germanium in a soluble matrix. The crystallite size was determined by x-ray diffraction (XRD) and Raman spectroscopy using a phonon confinement model. The crystallite size was found to decrease exponentially with milling time; however, the size determined by XRD was typically five to ten times greater than that by Raman. This was attributed to the presence of two separate crystallite sizes, which were averaged when using the Scherrer equation for the XRD data. Sonication of the powder resulted in the breakup of >20 μm aggregates into individual particles of approximately 40 nm. These particles are thought to compose a single crystal core with a crystallite size of approximately 28 nm surrounded by a layer of smaller crystallites (approximately 5 nm), which showed quantization during Raman spectroscopy. Separation of the germanium from the magnesium oxide was readily achieved using a simple acid leach, although some oxidation of germanium was evident when using an aqueous leach

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Mecanosynthèse et Activation Mécanique"

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2) M. Boudina

synthèse réactive des matériaux pour des applications aéronautiques à base de Ti-Al-Nb en utilisant de l'hydrogène.

3) Fumio Saito

Title: Mechanochemical Dissociation of HBB

Authors: Qiwu Zhang, Hiroki Matsumoto, Fumio Saito and Michel Baron*

Affiliations: IAMP, Tohoku University (Japan), *Ecole des Mines d'Albi (France)

Conférences orales

11) J. Foc, A. Legris, R.S. de Figueiredo

"Expériences virtuelles de mécanosynthèse : quand la simulation dévoile ce que les examens réels cachent"

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10) S. Galdeano*, M-H. Mathon*, L. Chaffron** et C-H. de Novion*

"Etude des corrélations entre les conditions de broyage et la nanostructure dans le composé magnéto-résistif

Cu₈₀(Fe_{0.3}Co_{0.7})₂₀"

*Laboratoire Léon Brillouin (CEA/CNRS), CEN Saclay, 91191 Gif-sur-Yvette

** DTA/DECM/SRMP, CEN Saclay, 91191 Gif-sur-Yvette

9) Sylvie Begin-Colin, T. Girot, G. Le Caër, F. Radjai, X. Devaux

"Mécanismes et modélisation de transformations de phase induites par broyage dans TiO₂"

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8) J.M. Le Breton, G. Khélifati, L. Aymard et J. Teillet

"Broyage réactif sous hydrogène d'alliages Nd-Fe-B : destruction et recombinaison de la phase Nd₂Fe₁₄B"

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7) A. Fnidicki, C. Lemoine, J. Teillet

Effets de la contamination en oxygène et en azote gazeux sur les propriétés structurales et magnétiques des alliages Fe-Cr obtenus par mécanosynthèse.

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6) B. Chevalier, J-L. Bobet et J. Etourneau

Influence du broyage énergétique sur les propriétés magnétiques d'intermétalliques à base de gadolinium et de manganèse

B. Chevalier, J-L. Bobet et J. Etourneau.

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Graphite broyé sous hydrogène ou sous oxygène: propriétés électrochimiques

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Raphaël JANOT et Daniel Guérard

La préparation, par mécanosynthèse d'hydrures de rubidium et de césium

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Technical Announcement

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VARIO-PLANETARY MILL "pulverisette 4"

The "pulverisette 4" vario-planetary mill is capable of emulating ball mills of conventional design, precisely simulating the types of stress entailed and thus reproducing or optimising grinding processes. Due to the high flexibility available for selecting the grinding parameters, it is possible to achieve results unattainable with any other ball mills.

This is the ideal mill for mechanical activation and alloying. The main applications are in the field of materials research and, of course, wherever a powerful, innovative planetary mill is required.

When particles < 10 mm are fed in, a final fineness up to 0.1 µm can be achieved. The useful capacity is between 2 x 30 ml in the case of 80 ml grinding bowls and 2 x 125 ml when 250 ml grinding bowl are used.

Method of operation:

With standard planetary ball mills the grinding bowls are rotating and mounted eccentrically on a rotating support disc. The rotational speed of the supporting disc can be selected at will; the grinding bowl rotates at a fixed transmission ratio.

Due to the overlapping of grinding bowls and supporting disc, the material to be ground and the grinding balls execute movements and trajectories in the grinding bowl, which are defined by the transmission ratio.

With the "pulverisette 4" vario-planetary mill the rotational speeds of grinding bowls and supporting disc can be adjusted completely independently of each other. By varying the transmission ratio it is possible to control the movements and trajectories of the grinding balls at will so that the balls strike the inner wall of the bowl vertically (high impact energy), approach each other tangentially (high friction) or just roll down the inner wall of the bowl (centrifugal mills).

All intermediate levels and combinations of frictional and impact pressures can be set as required. By changing the transmission ratio it is therefore possible for the first time to carry out mechanical activation as well as mechanical alloying.

Furthermore, it is also possible for the first time to optimally adjust a planetary ball mill to the material to be ground, the size of the grinding bowls and the grinding balls.

Features of performance:

- for the first time, all grinding parameters can be selected at will for optimal preparation of sample
- Programming of the grinding parameters by PC software as desired
- RS232 interface for programming and to transfer grinding parameters to the PC
- Real-time display of the speeds to monitor the grinding process
- Reversing option (direction of rotation reversed periodically) to improve the grinding results
- Emulation of various ball mills
- Variably adjustable pressure on sample (friction and/or impact)
- Final fineness << 1 µm
- Simultaneous grinding in up to 4 small or 2 large grinding bowls
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