RESEAU FRANÇAIS DE MECANOSYNTHESE

Lettre N°78

Septembre 2001

185 Groupes de Recherche

(dont 111 à l'étranger / 33 Pays)

Bureau du RFM : E. Gaffet (Président)

G. Le Caër (Secr. Gén.), A.R. Yavari (Trés.)

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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'2001 et quelques éléments mis a jour régulièrement concernant les derniers résultats dans ce domaine.

Prière de bien vouloir noter la Programmation 2002 et 2003 des Prochaines Journées Annuelles du Réseau Français de Mécanosynthèse

2002

Les JRFM'2002 seront intégrées dans le cadre du Congrès
Matériaux 2002
(Tours – France, du 21au 25 Octobre 2002)
Symposium 1 :
Poudres et Matériaux Nanostructurés,
du fondamental aux applications industrielles
Website : http://www.materiaux2002.net
E_mail : materiaux@materiaux2002.net

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2003

Les **JRFM'2003** auront lieu à Albi (Mai/Juin 2003)

Corresp. : mailto:Eric.Gaffet@utbm.fr

(Ecole des Mines d'Albi – Contact : M. Baron)
Thème : Matériaux Avancés, Micro, Nanotechnologie et Mécanosynthèse

FRITSCH: Your specialist in the processing laboratory (Press Release)

Contact : Andrea Köhler
FRITSCH GMBH - Laborgerätebau-Industriestrasse 8 - D-55743 Idar-Oberstein – Germany
Tel.: 06784/70-0 - Fax: 06784/70-11 - E-Mail: info@fritsch.de - Internet: http://www.fritsch.de/

"pulverisette 4" - Vario Planetary Mill

Fritsch presents the Vario-Planetary Mill "pulverisette 4" on the following exhibition:
22.10. - 24.10. Powder Metallurgy Congress & Exhibition - Nice, FRANCE

Main advantages:

1. In ball mills grinding is performed by friction and/or impact:
   - **high impact energy is released when balls impact vertically onto the interior grinding bowl wall**
   - **high friction is released when the balls approach the interior grinding bowl wall tangentially**
   - **in a centrifugal mill the grinding is performed by rolling the grinding ball along the interior grinding bowl wall**

The proportions of friction and impact in the case of traditional ball mills depends on fixed, pre-set transmission ratio.

In contrast to traditional planetary mills, the innovative Vario Planetary Mill "pulverisette 4" allows the rotational speed of grinding bowls and supporting disc to be adjusted completely independent of one another. 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.

Thus extremely different mill types can be simulated and the kind of loads they exhibit can be precisely reproduced. Grinding processes can be reproduced and the parameters can be optimally adapted to the sample material.

2. **With 2 powerful motors (4 kW and 1.5 kW) extremely high rpm's (unloaded up to 1000 rpm) can be set, so that very high energy input is possible, permitting a considerable reduction in grinding time**
3. **RS232 interface for programming the grinding parameters using PC software (included in the package), for outputting process data (validation), as well as for controlling the "pulverisette 4"**
4. **Real time display of the rotational speed for monitoring, reproduction or optimising the grinding process**
5. **reversing option (direction of rotation reversed periodically) to improve the grinding results**
6. **simultaneous grinding in up to 4 small (80 ml grinding bowls stackable) or 2 large 500 ml-grinding bowls**
7. **final fineness << 1 µm, making it visibly finer than that of traditional planetary mills**
8. **"safe-lock" bowl tightening is standard**
9. **use of gas pressure and temperature measuring system (GTM)**
10. **safety standard EN 61010 tested by the German Technical Inspection Agency and CE-mark**

Remarks:

The free selection of the rotational speed of grinding bowls and supporting disc make it possible for the first time to perform mechanical activation as well as mechanical alloying with a single mill by changing the transmission ratio. The main applications are in the field of materials research and, of course, wherever a powerful, innovative planetary mill is required.
Now a gas pressure and temperature measuring system (GTM) is available for measuring the gas pressure and temperature during the grinding process. This system was developed in co-operation with the Fraunhofer Institute for Applied Material Research in Dresden, and enables process values to be measured during the grinding process. A radio transmitter located in the lid of the grinding bowl sends data from the grinding bowl to a receiver, which is connected to a computer. The corresponding WINDOWS™ programme presents the results in the form of tables and graphics.

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Congress and School Announcements

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(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.

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

(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

"**VI International Symposium on Self-Propagating High-Temperature Synthesis, (SHS-2001)**"

Haifa, Israel . October 14-18, 2001.

More information on the

Web site: **htpp://www.technion.ac.il/technion/materials**

Nano 2002

16 - 21 Juin 2002

Orlando, Florida - USA

Website : http://www.nano2002.com/

Workshops

Gordon Research Conference on Granular and Granular-Fluid Flow

Plymouth, NH, USA June 30 - July 5 ,2002

http://sol.rutgers.edu/~shinbrot/gordon2002/gordon2002.html

RQ11

Rapidly Quenched and Metastable Materials

25-30 August 2002

Department of Materials, University of Oxford, UK

Contact: RQ11 Conference Organiser, Beggars Roost, Channels End Road,

Comworth Bedford MK44 2NS, U.K.

Tel: +44 (0) 1234 378862

Fax: +44 (0) 1234 376219

E-mail: mailto:rq11@materials.ox.ac.uk

Website: http://www.materials.ox.ac.uk/rq11

10th European Symposium on Comminution

Heidelberg from 2-5 September 2002.

Org. European Federation of Chemical Engineering

Full information available at http://www.comminution2002.de

L. A. C. A. M. E – 2. 0. 0. 2

EIGTH LATIN AMERICAN CONFERENCE

ON APPLICATIONS OF THE MÖSSBAUER EFFECT

PANAMA, 22-27, SEPTEMBER, 2002.

E-mail: mailto:lacame2000@fisica.ciens.ucv.ve

http://www.up.ac.pa/Eventos/lacame2002/inicio.htm

Matériaux 2002

Tours - France

21- 25 Octobre 2002

Website : http://www.materiaux2002.net

E_mail : materiaux@materiaux2002.net

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SOUTENANCES DE THESE
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Sébastien Lehnard

"Texture, Microstructure et Propriétés d'un Alliage Fe-40 Al à grains fins obtenu par métallurgie des poudres et extrusion : Influence des paramètres du procédé et de traitements thermiques"

Université de Metz - 5 octobre 2001-08-23

Jury :
R. Schwarzer (Rapp.), E. Gaffet (Rapp.), JP Morniroli, V Skrotzi, R. Baccino, A. Hazotte, F. Wagner (Dir. Thèse), Th. Grosdidier (Co. Dir. Thèse)

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Nathalie Bouad

"Mise au point d'un procédé d'élaboration de matériaux thermoélectriques pour thermogénérateur.
Potentialité de la mécanosynthèse d'alliages à base de tellurure de plomb"

Montpellier, Université Montpellier II, 10 mai 2001

Jury :
J. Foct, J.C. Niepce, H. Scherrer, R. Griot, A.M. Bouchardy, J. Delallée, Y. Lacrouts-Cazenave, M. Ribes, J.C. Tédenac, R.M. Marin-Ayral (directeur de thèse)

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Bulletin d'adhésion 2001 / Subcription Print

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

Eric GAFFET
CNRS UMR5060 « Métallurgies et Cultures »
Thème « Nanomatériaux : Elaboration et Transitions de Phases Hors Equilibre »
Site de Sévenans (UTBM)
F90010 - Belfort Cedex - F'rance

Nom/Name : .....Prénom / First Name : .....
Adresse complète / Full Address : .....
.....
Téléphone/ Phone: .....Télécopie (Fax) : .....
e_Mel. / e-Mail : .....
désire adhérer au Réseau Français de Mécanosynthèse /want to become 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).

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Cooperative Research on Related Areas
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France (12/04/2001)
Le portail Internet "France Contact" a été lancé: ce portail s'adresse aux chercheurs etrangers séjournant ou ayant séjourné en France et permettra le suivi et l'animation du réseau que constituent les milliers de chercheurs étrangers ayant effectué un sejour scientifique au sein des établissements et des organismes de recherche français:
Website : http://www.francecontact.net

Europe (6/03/2001)
The ESF, on the recommendation of the scientific Standing Committee for Physical and Engineering Sciences (PESC), will support, in fields related to PESC's remit, approximately 10 ESF Exploratory Workshops to be held in 2002.
Each workshop will allow 20-25 leading European scientists to explore novel ideas at the European level with the challenging aim to "spearhead" new and preferably inter-disciplinary areas of research.
In specific terms, PESC's 2001 Call is for workshop proposals on R&D subjects which are NOVEL AND PREFERABLY INTERDISCIPLINARY and which concern emerging fields within any of the following areas: chemistry, physics, mathematics, information sciences, fundamental engineering sciences, materials sciences, and technologies research in these areas.
The PESC Call is available at http://www.esf.org/physical/WorkshopCalls/Call2001.htm

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

From Dr. Jack Harrowfield - Autralie
Job Opportunities
23/08/2001

Advanced Nano Technologies Pty Ltd

Nanotechnology.....

Advanced Nano Technologies Pty Ltd is a $15 million joint venture between Advanced Powder Technology Pty Ltd and Samsung Corning Co Ltd, established to commercialise a patented mechanochemical process used to manufacture NanoPowders.

ANT has recently been awarded a $2.8 million R&D Start Grant from theAustralian Federal Government and as a result, we are currently expanding our Perth-based Research and Development team. Exciting opportunities exist for highly qualified and motivated scientists and engineers to join our R&D team and assist in developing a leading, globally-focused nanotechnology company.

Positions are available in the following areas:

Research Opportunities

Research Scientist -Surfactants/Coatings: To undertake research and development of dispersants for ANT's nanopowders. You will have a PhD or equivalent experience in surface or colloid chemistry. A good understanding of dispersion science and technology is essential.

Research Scientist - Particle Coatings : To undertake research and development of particle surface coatings for ANT's nanopowders to improve chemical stability and facilitate incorporation into various polymers and solvents. You will have a PhD or equivalent experience in surface, colloid and/or polymer chemistry.

Materials Scientist/Engineer - Nanopowder Synthesis: To undertake research and development of new nanopowders manufactured by the mechanochemical process technology. Your will have a PhD or equivalent experience in Materials Science/Engineering, Solid State materials Chemistry or Solid State Physics.

Product Engineer - Process Optimisation : To undertake product development, with particular focus on

the optimisation of the manufacturing process for specific nanopowders. You will work with research and production personnel to achieve targeted results. A PhD or equivalent experience in Materials Science/Engineering is required.

Interested applicants should send their CV, with a cover letter explaining how their background and experience will assist them in tackling the challenges of performing research in a newly emerging, rapidly changing industry.

Send To: Human Resources, Advanced Nano Technologies,
112 Radium St Welshpool, 6106, Western Australia.
For further information contact Brian: info@ant-powders.com
ph (08) 9380 3077, fax (08) 9380 1116
Closing date: Sep 14th
www.ant-powders.com

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From Dr. Dr. Deliang Zhang
Ph D Position
University of Waikato, New Zealand - 23 / 08/2001
Titanium PhD ScholarShip - Department of Materials and Process Engineering-
The Department of Materials and Process Engineering at the University of Waikato is seeking a suitable candidate for the Titanium Ph.D Scholarship which has a value of up to NZ$22,000 per year and is offered for three years. The recipient of the scholarship will be required to conduct research on a suitable topic in the area of processing, characterisation and development of titanium based materials. He/she will work within a dynamic team at Waikato University working on a large research project on processing and development of titanium based materials. The candidate must have a BE (Honours), BSc(Honours), or a Master degree in materials science and engineering or closely related subjects with good average grade

To apply, please send a copy of CV and undergraduate and postgraduate (if applicable) transcript to
Dr. Deliang Zhang, 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.
The application process will remain open until a suitable candidate is identified.

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From Prof. H.-E. Schaefer
Ph D Position
Stuttgart - 21/08/2001
In the framework of the 5th European Research and Development Program The Institut fuer Theoretische und Angewandte Physik, Stuttgart University, Research group of Prof. H.-E. Schaefer has been selected a Marie Curie Training Site
and offers a one year position on Nanostructured Materials: Atomic Transport Properties for the Synthesis and Characterization of Novel Soft and Hard Magnets

The Ph.D. student will receive a monthly payment of 1200 Euro plus additional 100 Euro per month travel allowance. Post-Docs should ask us for further details.

Applicants are invited for a 12 month term as a research fellow supported by individual fellowships of the Marie Curie fellowship scheme. The successful candidates will be involved in the synthesisand processing of novel nanostructured materials and composites for soft magnets (Finemet-type) and hard magnets (FeNdB-type), as well as with the investigation of their microstructure, magnetic, and diffusional properties. The gas-phase condensation technique with subsequent compaction under high pressure is used for the productionof highly dense nanocrystalline materials. Basic material characterisation will be carried out by x-ray diffraction, differential scanning calorimetry, optical microscopy, and atomic resolution electron microscopy (HRTEM). In addition, several instruments for characterisation of magnetic materials are available. These experimental
techniques allow the investigation of a number of phenomena, including: order-disorder transformations, transformation kinetics, phase transitions, and relaxation processes. Furthermore, diffusion studies using the radioactive tracer technique are carried out in order to study the atomic transport properties in nanocrystalline structures.

The candidates have to satisfy the basic criteria of the training scheme as outlined on the Marie Curie Host Fellowship Web site http://www.cordis.lu/improving/fellowships/home.htm. As the fellowship forms part of a higher degree project, the candidates should be registered as full-time Ph.D. research students in a well recognized institution. The research interest of the candidates should be in at least one of the

following fields: solid state physics, materials science including synthesis and characterization of materials, mechanical and magnetic properties of advanced materials, and structural studies.

The group closely cooperates with the Max-Planck-Institut für Metallforschung, Stuttgart. This collaborative character of the research training provides an additional international profile to the education of the fellows increasing their interaction and eventually their activecollaboration with research institutions in different European
countries.

Applicants, also Post-Docs, should contact us for further information:

Prof. H.-E. Schaefer
e-mail mailto:schaefer@itap.physik.uni-stuttgart.de
phone: +49-711-685-5261
FAX +49-711-685-5271

Dr. W. Sprengel
e-mail mailto:sprengel@itap.physik.uni-stuttgart.de
phone: +49-711-685-5192
FAX +49-711-685-5271

http://www.itap.physik.uni-stuttgart.de/~gsweb/english/index.html
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Post Doc Position
Dijon/ France (10/07/2001) – From F. Bernard

The research group (fine grain materials) from the Research Lab UMR 5613 (Laboratoire de Recherche sur la Réactivité des Solides) is seeking for a post doctoral associate with experience in X – ray Diffraction (experimental and numerical approaches, computer simulation, Monte Carlo ...).

The candidate (he or she) has to demonstrate the ability to work independently, contribute to innovative numerical approach, and develop new projects in this area.

The work will be performed in collaboration between three french labs (Dijon – F. Bernard, Belfort – E. Gaffet, Vitry - Y. Champion).

Scientific Field : In spite of a lot a research effort, the mechanism of phase formation during MA is not well understood. It is most often proposed that the process of MA introduces a variety of defects (vacancies, dislocations, grain boundaries, staking fault,…) which raise the free energy of the system making it possible to produce metastable phases. But there are very few investigations that deal with the characterization and quantification of the defects produced in mechanically alloyed powders. As a primary investigation, the effect of the mechanical activation mode (i.e. the friction or direct shock ones, at least the component ratio of both components) can be assumed on analysing the microstructure of post-mortem milled powders. XRD is really a valuable technique for a characterisation in terms of size and morphology of crystallites and imperfections (microstrains, dislocation, stacking faults,….). Indeed, the ball milling of metals or alloys induces extended variations in the intensity distribution of XRD diagrams and, in particular, in the line profile. Knowledge of the stacking fault density and the twin-fault density is essential to understand the nanomaterials behaviour.

A new line profile analysis method is proposed by Ustinov et al. [123], in order to take into account the dependence of the crystallite size, of the residual strains as well as of the planar defects, on the line profile broadening that may be observed on ball-milled materials. Such a method will allow to understand the influence of ball-milling parameters and for controlling the synthesis of nanostructured materials

Financial Support : Regional Financial Support from Burgundy Region in France

Interested candidates should send **correspondence** to:
BERNARD Frédéric - Université de Bourgogne - UFR Sciences et Techniques
9, Avenue Alain Savary - Laboratoire de Recherches sur la Réactivité des Solides,
UMR 5613 CNRS / Université de Bourgogne - Equipe "Matériaux à grains Fins"
B.P. 47870 - 21078 DIJON CEDEX
fax : 33.3.80.39.61.67 - e-mail : fbernard@u-bourgogne.fr
Please note that this proposal is opened for french students.
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Singapour (11/06/2001) – From Professor L. Lu
Post-doctoral fellow position
The position requires candidates with an Ph.D. degree materials science. He/she should have a demonstrated track record on synthesis of metallic amorphous materials. Preference will be given to candidates with relevant experience of mechanical alloying.
The application form can be downloaded from the website:
http://www.nus.edu.sg/NUSinfo/Appoint/RESAPPT.HTML

Please submit your application to
Associate Professor L. Lu
Dept. of Mechanical Engineering

National University of Singapore
10 Kent Ridge Crescent
Singapore 119260
E-mail: mailto:mpeluli@nus.edu.sg

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Brazil (4 / 6 / 2001) – Post Doc Position from Professor Gerardo F. Goya
The Magnetic Materials Group at São Paulo University is seeking a postdoctoral associate with experience in powder synthesis and magnetism to work on nanoestructured ceramics. The candidate should demonstrate the ability to work independently, contribute to innovative experimental design, and develop new projects in this area. Background in at least three of the following areas is desirable: Mechanochemical synthesis. Mechanical alloying. Magnetism in nanostructured systems. Transport measurements. Mossbauer Spectroscopy Scanning/Transmission Electron Microscopy
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 two references that can comment on the candidate's capabilities. Position is open for applicants within three years of receipt of Ph.D. The postdoctoral contract will be one+one year, with salary U$ ~15000 /y.

Applicants should send the information before 15-August-2001.

Interested candidates should send **correspondence** to:
Professor Gerardo F. Goya
Laboratório de Materiais Magnéticos
Instituto de Fisica - Universidade de Sao Paulo
CP 66318 Sao Paulo
05315-970 SP Brazil
e-mail: goya@macbeth.if.usp.br
Fax: (55) 11 3818 6984
Desk: (55) 11 3818 6885

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France (28/05/2001) – from V. Nivoix

Proposition de sujet de thèse du

Laboratoire d'Analyse Spectroscopique et de Traitement de Surface des Matériaux,
UPRES EA 1290, Université de Rouen

Relation structure-propriétés d'oxydes mixtes nanométriques élaborés par différentes voies de synthèse

Les ferrites mixtes manganèse-zinc utilisés dans les composants électroniques sont des ferrites doux toujours très utilisés de nos jours, dont les performances peuvent encore être améliorées.

Les propriétés magnétiques, largement conditionnées par la répartition cationique dans les sites de la phase spinelle, dépendent également de la microstructure et plus particulièrement de la porosité et de la taille moyenne des grains dans le matériau final.

Le procédé industriel actuel par voie céramique ne permet pas d'obtenir une microstructure dense à grains fins pourtant très favorable. De nouvelles voies de synthèse sont actuellement explorées, notamment dans le domaine de la "chimie douce".

Nous nous proposons d'élaborer ces oxydes sous forme de poudres nanométriques par broyage à haute énergie et par voie hydrothermale puis de comparer leurs caractéristiques physiques et structurales.

La synthèse par broyage à haute énergie se fera à l'aide d'un broyeur planétaire nouvelle génération (P4 de Fritsch) permettant d'optimiser le broyage par une meilleure maîtrise des paramètres techniques.

Pour mener à bien la caractérisation complète de ces matériaux nous disposerons de différentes techniques telles que la diffraction des rayons X, la spectrométrie IRTF et la spectrométrie Mössbauer pour la caractérisation structurale, la microscopie électronique à balayage haute résolution ou à transmission et la DRX pour la taille et la morphologie, un SQUID pour les propriétés magnétiques. D'autres méthodes d'analyse pourront être mises en œuvre selon les besoins de l'étude.Le candidat ou la candidate devra avoir des connaissances en chimie des solutions aqueuses et sur la caractérisation des matériaux (diffraction des rayons X, spectrométrie IR,spectrométrie Mössbauer, mesure de magnétisme ...)

Financement : Nous ferons une demande de financement auprès du ministère de la recherche ou de la région Haute-Normandie.

Contacts : Virginie NIVOIX ou Malick JEAN - Université de Rouen - LASTSM-IUT
76821 Mont Saint Aignan Cedex
tel 02 35 14 63 59 fax 02 35 14 63 58
email : malick.jean@univ-rouen.fr

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SPAIN (03/04/2001)- From J.J. Suñol (joanjosep.sunyol@udg.es)

Postdoctoral researchers required Universitat de Girona

Soft magnetic materials obtained by mechanical alloying and rapid solidification: thermal and structural characterization. Analysis of nanocrystallization process.

The research position will involve aspects of: materials processing by mechanical alloying, thermal and structural characterization by DSC, TG,, XRD, SEM, TEM, TMS; kinetic modeling.

The position will began with effect from september 2001 to september 2002.
Interested candidates should send correspondence to: Dr. J.J. Suñol.
Department of Physics,, EPS (P II). Girona University. E-17071. Girona,
Spain. Fax: 34-972418098.
E-mail: mailto:joanjosep.sunyol@udg.es
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(From Paul J. Warren – 6/03/2001)

A Research Training Network on nanostructured Aluminium alloys is urgently looking for researchers. There are opportunities for Post-doctoral and Pre-doctoral researchers available immediately in Oxford(UK), Grenoble(F), Turin(I), Stockholm(S), Madrid(E), Waterford(IRL), Ioannina(G), Warsaw(PL), and Bratislava(SK). Please pass this information to anyone who may be interested.
For further details please visit the website http://www.materials.ox.ac.uk/nano-al.
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Post Doctoral Fellow Positions - University of Toronto (5/03/2001)

The University of Toronto is seeking three postdoctoral fellows for a major new initiative in laser nanofabrication, material diagnostics, and nano-optics fabrication. State-of-the-art laser-processing facilities and optical material fabrication and diagnostic infrastructure are funded from various government and industrial sources. The research is centered in the Photonics Group of the Department of Electrical and Computer Engineering, and directed by Professor Peter R. Herman.

1 - F2-Laser Nanofabrication Facility The post doctoral fellow will drive the development of precise optical tools and nanofabrication processes in one of the world's forefront facilities for F2-laser nanofabrication research. The record short-wavelength light of 157 nm drives strong interactions in challenging materials at sub-micron feature sizes that are attractive for widespread application in fabricating photonic components, optical circuits, lab-on-a-chip systems, and wireless electronic circuits. Responsibilities include co-supervision of graduate students, coordination of research activities with scientists from academia and industry, and co-management of the novel facility. The $1 million program also includes establishing state-of-the-art optical communication diagnostics. The research goals are new micromachining and photosensitivity processes for fabricating and/or tuning optical circuits, 3-D photonic devices, photonic bandgap structures, and binary optics. These studies are to be integrated with related program in ultrafast laser processing.

2 - Photonic-Bandgap Integrated Optical Circuits An outstanding candidate is sought for a collaborative project to integrate photonic bandgap structures into functional optical circuits. Three-dimensional diffractive optical structures offer in theory, powerful capabilities in managing light in optical circuits. The goal is to practically harness this capability within the structure of our existing photonics fabrication program (the F2-laser nanofabrication facility and ultrafast-laser processing laboratory) and through collaboration with a leading photonic-bandgap group at the University of Toronto. The project is suited to a technically strong and creative individual motivated to revolutionize the future manufacturing of photonic circuits.

3 - Laser-Induced Breakdown Spectroscopy of Aluminum A laser-spectroscopy specialist is required to drive an industrially sponsored research program in laser-induced breakdown spectroscopy of recycled aluminum. The goal is to develop novel laser and diagnostic technology for collecting accurate assays of aluminum metal for a future large-scale pilot project in automobile recycling by Alcan International. One project is the study of a new laser interaction - invented at the University of Toronto - that entails high-repetition 'bursts' of ultrafast laser pulses. This approach promises to cleanly remove surface oxides and precisely probe the underlying bulk aluminum within a single burst. Research centers on fundamental laser interactions and defining laser processing windows in cooperation with our industrial partner.

The research positions entail extensive academic collaboration within the Engineering Faculty, the Department of Physics, the Department of Chemistry, and Photonics Research Ontario (www.pro.on.ca) and with other academic research centers: Laser Labortorium, Goettingen, Germany; National Research Council, Canada; and Optical Fibre Technology Centre, Australia. Research also includes close interaction with world-leading photonics and manufacturing companies in Canada (i.e. JDS Uniphase, Mitel, Raytheon Elcan Optical Technology, Alcan International) and internationally (i.e. Photonics Integrated Research, Lambda Physik, MicroLas). Our principle goals are forefront science and engineering research for public dissemination in high-quality journals and the generation of intellectual property. Successful candidates will lead one of the following three research areas.

Required qualifications for all three positions include a Ph.D. in experimental Physics, Engineering Science, or Electrical Engineering, and experience with several of the following areas: F2 or excimer lasers, ultrafast lasers, optical and opto-mechanical design, photonic devices for optical communications, optical waveguide fabrication and modelling, optical communication diagnostics, photonic bandgaps, laser-matter interaction physics, spectroscopy, and material diagnostics (SEM, FTIR, AFM, SEM, EDX, ESR). An independent and highly motivated person with good technical and communication skills is required. Each position entails a supervisory role with graduate students and other researchers. The successful candidate will also be responsible for coordination and administration of research involving visiting scientists and industrial partners in the local booming Photonics industry.

The postdoctoral positions are available immediately and remain open until filled. Provide a CV, relevant publications, three references, and recent university transcripts by mail, electronically, or by fax:
Professor Peter R. Herman
10 King's College Rd. Tel: 416-978-7722 - Dept. of Electrical and Computer Engineering Fax: 416-971-3020
University of Toronto, Toronto, ON hermanp@ecf.utoronto.ca - M5S-3G4, CANADA

The University of Toronto is Canada's top university, located in the center of Canada's largest and most dynamic city. Toronto is home to a large and diverse immigrant population and has low-crime rates. See more at:
http://www.utoronto.ca/toronto.htm
Further Employment Information: http://www.ecf.utoronto.ca/~hermanp/job_available.htm

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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 by 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.

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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

Bibliographie Récente

Livres ou "Special Issues"

(21/06/2001)
From Christian Wohlbier (Scientific. Net Webmaster)
This is a service of http://www.scientific.net
***** Materials Science Forum *****
Materials Science Forum specializes in the rapid publication of international conference proceedings and stand-alone volumes on topics of current interest. It covers all areas of Materials Science, Solid State Physics and Solid State Chemistry. The periodical is indexed in Science Citation Index and covered by all major abstract media.
Volume 246 until 246 [Surface Coatings for Advanced Materials] and
Volume 207 until 209 [Intergranular and Interphase Boundaries in Materials]
http://www.scientific.net/msf
***** Solid State Phenomena *****
Solid State Phenomena specializes in the rapid publication of international conference proceedings and stand-alone volumes on topics of current interest in the field of solid state physics and its applications to materials science related topics. The periodical is indexed in Science Citation Index and covered by all major abstract media.
Volume 61 until 62 [Contemporary Studies in Condensed Matter Physics],
Volume 59 until 60 [Interfaces and Plasticity] and
Volume 57 until 58 [Gettering and Defect Engineering in Semiconductor Technology]
http://www.scientific.net/ssp

(07/06/2001)
« Strategic and Technological Watch on Nanomaterials »
by **E. Gaffet** (1998 – 2000) – 4 CD reports (6.000 analysed references)
Editeur : Innovation 128 - 24 Rue du Quatre Septembre - 75002 Paris - France - Fax : 33 1 42 65 47 76
Website : http://www.innovation128.fr/

(28/05/2001)
Advanced Ceramic Materials
***** Key Engineering Materials, Volume 122 until 124 *****
In spite of the very great progress made in ceramic science, and the elegance and excitement of the research which has been performed, the real driving force for developments in ceramics remains their potential applications. The opportunity for dramatic scientific advances was certainly one reason for the "ceramic fever" of a decade ago, but there is also no doubt that the
prediction of an annual market for fine ceramics, amounting to 6 billion Yen played a role The challenge is to ensure that ceramics can be successfully introduced into the full breadth of applications where their properties have long made them so appealing. The present volume takes a refreshing and firm step towards the realization of this aim. The publication of a book which sets out to present ceramics from the specific point of view of applications is an event greatly to be welcomed. Systematic organization into various types of application ensures that the reader can fully appreciate the outstanding opportunities offered; and the present limitations. Armed with such a survey, the engineer and scientist will be fully alert to possibilities for progress whenever these arise 1. Introduction. 2. Electrical and Electronic Functions. 3. Magnetic Functions. 4. Chemical and Physical Functions. 5. Mechanical and Thermal Functions. 6. Biological Functions. 7. Nuclear Applications. 8. Ceramic Coatings. 9. Selected Ceramics with Multi-Applications.
http://www.scientific.net/kem

(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 Riecansky 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 - EgyptContents -

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(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

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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/cambsi/book52.htm

"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 nanométres. A ces dimensions, les propriétés des matériaux changent radicalement.
Au début des années 90, les japonais ont été les premiers a lancé d'ambitieux programmes de R & D puisque le MITI a consacré aux nanomatériaux près de 200 millions de dollars pour la période 1990 - 2000 et que la Science & Technology Foundation a investi presque la même somme pour co - financer des projets de laboratoires publics et privés. Les Etats Unis puis les pays européens ont investi plus tardivement mais déjà ont obtenu des résultats prometteurs (••••••) Certaines applications existent déjà au niveau international, quelque 400 sociétés se partagent aujourd'hui un marché voisin de 1 milliard de dollars mais qui devrait tripler, voire quintupler à l'horizon 2001.(••••••)
(•••) Pour aider les industriels concernés à imaginer les applications qu'ils pourraient s'approprier et identifier les acteurs internationaux, la présente étude dresse un état de l'art complet des nanomatériaux en décrivant leurs procédés d'élaboration actuels ou envisagés et en détaillant leurs différentes propriétés physico - chimiques et les géométries que l'on peut obtenir.
Enfin l'étude permet de cerner les applications actuelles et potentielles•••

Patent / Brevet

ONE STEP SYNTHESIS AND CONSOLIDATION OF NANOPHASE MATERIALS
Z.A. Munir, F. Charlot, F. Bernard, E. Gaffet – International patent WO 0112366 (publié le 22.02.2001)
Solid reaction products with a dense nanocrystalline structure are formed from reactant particles with diameters in the nano – scale range by compacting the particles into a green body, then passing an electric current through the body causing Jouel heating sufficient to intitiate the reaction to form the reaction product while simultaneously applying pressure to the reacting body to densify it to a density approaching the theoritical density of the pure product. Surprinsingly, this process results in a reaction product that retains the nanocrystalline structure of the starting materials, despite the fact that a reaction has occured and the materials have been subjected to highly stringent conditions of electric current, heat and pressure.

L'adresse du site web où trouver le texte complet du brevet...
http://164.195.100.11/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=/netahtml/search-bool.html&r=1&f=G&l=50&co1=AND&d=ft00&s1=gaffet.INZZ.&OS=IN/gaffet&RS=IN/gaffet
ou encore pour la version brevet d'application
http://l2.espacenet.com/dips/bnsviewer?CY=ep&LG=en&DB=EPD&PN=WO0112366&ID=WO+++0112366A1+I+

Périodiques

[50] STUDY OF THE MICROSTRUCTURE OF NANOCRYSTALLINE AL-5 AT.% TI COMPACTS PREPARED BY REACTIVE BALL MILLING AND ULTRA-HIGH-PRESSURE HOT PRESSING
Il-Moon-K; Park-HS; Lee-KS - JOURNAL-OF-ALLOYS-AND-COMPOUNDS. JUL 26 2001; 325 (1-2) : 236-244
The consolidation behavior of nanocrystalline A-5 at.% Ti powders was investigated using an ultra-high-pressure hot pressing method. Nanocrystalline Al-5 at.% Ti compacts with full density were successfully synthesized by hot pressing for 250 s at 120 degreesC under 4.8 GPa and the grain size was less than 50 nm. It is considered that each grain in the as-compacted materials maintained a random orientation with respect to neighboring grains. The consolidation temperature, 120 degreesC, is about 300-400 degreesC lower than the conventional temperature. Abnormal grain growth was observed in specimens prepared at temperatures over 300 degreesC, which is more than one-half the absolute melting temperature of Al. Some grains grew more than 500 nm in these specimens. Rockwell hardness and Vickers micro-hardness values of specimens prepared using the appropriate conditions were 105.2 HRB and 243.7 H-V, respectively. This hardness value is one of the highest ever obtained in Al-5 at.% Ti alloys

[49] CHARGE BEHAVIOUR AND POWER CONSUMPTION IN BALL MILLS: SENSITIVITY TO MILL OPERATING CONDITIONS, LINER GEOMETRY AND CHARGE COMPOSITION
Cleary-PW SO: INTERNATIONAL-JOURNAL-OF-MINERAL-PROCESSING. AUG 2001; 63 (2) : 79-114.
Discrete element method (DEM) modelling has been used to systematically study the effects of changes in mill operating parameters and particle properties on the charge shape and power draw of a 5-m ball mill. Specifically, changes in charge fill level, lifter shape (either by design or wear) and lifter pattern are analysed. The effects of changes to the properties of the charge (ball fraction, ball and rock shape, type of ball and rock size distributions and the lower cutoff of the rock size distribution) can all be interpreted in terms of their effects on the shear strength of the charge. Some changes increase the shear strength leading to higher dynamic angles of repose of the charge, higher shoulder positions and higher power consumption for sub-critical speeds. For super-critical speeds, they lead to lower power consumption, due to lower particle mobility as the particles lock together better. Changes to the charge that weaken the interlocking of particles have the opposite effect on the charge shape and power consumption. The combination of these effects means that the speed for which peak power consumption occurs is predominantly determined by the shear strength of the charge material and the fill level. This demonstrates the sensitivity of mill behaviour to the charge characteristics and the critical importance of various assumptions used in DEM modelling.

[48] PREPARATIONS OF SILICA SLURRY FOR WAFER POLISHING VIA CONTROLLED GROWTH OF COMMERCIAL SILICA SEEDS
So-JH; Bae-SH; Yang-SM; Kim-DH - KOREAN-JOURNAL-OF-CHEMICAL-ENGINEERING. JUL 2001; 18 (4) : 547-554.
Silica slurry in aqueous medium for wafer polishing was prepared by sol-gel reaction of silicon alkoxide utilizing commercial silica particles as seeds that were grown stepwise through intermittent additions of tetraethy 1-orthosilicate (TEOS) as a silica precursor. Before the growth reaction, the commercial silica particles were pre-treated in the vibratory mill partially filled with zirconia ball and the sonicator to ensure good dispersion. The alcohol left after growth reaction was removed by vacuum distillation and repeated washings with distilled water followed by centrifugations. Then, the alcohol-free silica particles were redispersed in water. The dispersion stability of the silica slurries was examined by measuring surface charge of silica particles and rheological properties. Finally, wafer-polishing performance of the prepared silica slurries was considered by measuring the polishing (or removal) rate, and RMS (root mean square) roughness of the polished wafer surface. For the polishing, MEA (monoethanolamine) and TMAH (tetramethylammonium. hydroxide) were used as polishing accelerators. The polishing result showed that the removal rate was nearly independent of the concentrations of MEA and TMAH in the range of 0.3-0.5 wt% and 100-500 ppm, respectively. One of the most interesting features is that hydrothermal treatment of the prepared silica slurries in autoclave increased the removal rate as high as ten times. Although the removal rate was increased by the increased size of the abrasive particle, surface roughness of the polished wafer surface was deteriorated.

[47] STUDY OF THE MICROSTRUCTURE OF NANOCRYSTALLINE AL-5 AT.% TI COMPACTS PREPARED BY REACTIVE BALL MILLING AND ULTRA-HIGH-PRESSURE HOT PRESSING
Il-Moon-K; Park-HS; Lee-KS - JOURNAL-OF-ALLOYS-AND-COMPOUNDS. JUL 26 2001; 325 (1-2) : 236-244
The consolidation behavior of nanocrystalline A-5 at.% Ti powders was investigated using an ultra-high-pressure hot pressing method. Nanocrystalline Al-5 at.% Ti compacts with full density were successfully synthesized by hot pressing for 250 s at 120 degreesC under 4.8 GPa and the grain size was less than 50 nm. It is considered that each grain in the as-

compacted materials maintained a random orientation with respect to neighboring grains. The consolidation temperature, 120 degreesC, is about 300-400 degreesC lower than the conventional temperature. Abnormal grain growth was observed in specimens prepared at temperatures over 300 degreesC, which is more than one-half the absolute melting temperature of Al. Some grains grew more than 500 nm in these specimens. Rockwell hardness and Vickers micro-hardness values of specimens prepared using the appropriate conditions were 105.2 HRB and 243.7 H-V, respectively. This hardness value is one of the highest ever obtained in Al-5 at.% Ti alloys.

[46] EFFECT OF BALL-MILLING WITH NI AND RANEY NI ON SURFACE STRUCTURAL CHARACTERISTICS OF TIV2.1NI0.3 ALLOY

Inoue-H; Miyauchi-R; Tanaka-T; Choi-WK; Shin-Ya-R; Murayama-JI; Iwakura-C JOURNAL-OF-ALLOYS-AND-COMPOUNDS. JUL 26 2001; 325 (1-2) : 299-303

Surface structural characteristics of TiV2.1Ni0.3-Ni and TiV2.1Ni0.3-Raney Ni composites, which were prepared by ball-milling a TiV2.1Ni0.3 alloy with Ni or Raney Ni under an Ar atmosphere, were investigated by X-ray diffractometry, Auger electron spectrometric analysis (AES) and so on. The ball-milling with Ni or Raney Ni did not influence the bulk crystal structure of the TiV2.1Ni0.3 alloy. The mutual diffusion layer, which was presumed to be responsible for retarding the progress of the corrosion, was found to be formed in the interface region between Ni and alloy components during the ball-milling with Ni or Raney Ni. The AES depth profile of the constituent elements for the TiV2.1Ni0.3-Ni composite, however, was different from the TiV2.1Ni0.3-Raney Ni composite due to the difference in the coverage and the homogeneity of the surface modification, which also influenced the time course of the rest potential. The ball-milling with Ni and Raney Ni greatly decreased the onset temperature of weight loss assigned to dehydriding from dihydride to monohydride and from monohydride to alloy.

[45] PREFORMULATION STUDIES ON THE S-ISOMER OF OXYBUTYNIN HYDROCHLORIDE, AN IMPROVED CHEMICAL ENTITY (ICE (TM))

Luner-PE; Kirsch-LE; Majuru-S; Oh-E; Joshi-AB; Wurster-DE; Redmon-MP - DRUG-DEVELOPMENT-AND-INDUSTRIAL-PHARMACY. 2001; 27 (4) : 321-329

(S)-Oxybutynin HCI (S-OXY) is a white crystalline solid powder with an acicular particle morphology. Differential scanning calorimetry (DSC) thermograms revealed one characteristic endotherm at. 116.2 degreesC. On rescanning a sample heated to 120 degreesC, no thermal events were distinguished in the temperature range 25 degreesC to 150 degreesC. Weight loss curves determined by thermogravimetric analysis showed a continuous, gradual weight loss of about 0.15% over the temperature range 30 degreesC to 110 degreesC, followed by a change in slope and more rapid weight loss beginning at 150 degreesC. Observation by hot-stage microscopy confirmed the melting endotherm observed by DSC. Equilibrium moisture uptake studies indicated low water vapor uptake at low relative humidities (<52.8%). At relative humidities of 75.3% and 84.3%, S-OXY first deliquesced and then converted to a lower melting point crystal form. X-ray powder diffraction (XRPD) data supported the DSC findings. S-OXY underwent degradation by ester hydrolysis at alkaline pHs. The kinetics of this reaction were studied at 25<degrees>C in carbonate-bicarbonate buffers. Observed rate constants of 0.008 h(-1) and 0.0552 h(-)1 were determined at pH 9.69 and 10.25, respectively. The pK(alpha) of S-OXY was 7.75. The aqueous solubility of S-OXY was described as a function of pH and the free-base solubility. The mean partition coefficient log P was 3.33 using 1-octanol. The surface tensions of aqueous solutions of S-OXY decreased with increasing concentration, but no concentration-independent region was observed, indicating that S-OXY does not form micelles in aqueous solution . The dissolution rate of S-OXY from a compressed disk in 0.1 N HCl was rapid, whereas it was considerably slower at pH 7.4. Addition of 1% hexadecyltrimethylammonium bromide (CTAB) at pH 7.4 significantly improved the dissolution rate. S-OXY displayed very poor flow properties when compared to standard pharmaceutical excipients. XRPD results indicated that S-OXY exhibited a loss in crystallinity following ball milling. Hiestand tableting indices indicated that S-OXY has good bonding properties and forms strong compacts, but is likely to be susceptible to capping on ejection from the die. This indicated the need for a plastically deformable excipient such as Avicel PH-101 in tablet formulation.

[44] MECHANOCHEMICAL SYNTHESES OF BISMUTH SELENIDES

Klose-E; Blachnik-R - THERMOCHIMICA-ACTA. JUL 20 2001; 375 (1-2) : 147-152.

Bi + Se mixtures in the molar ratios of 2:3, 1:1. and 2:1. as well as a Bi + Sb + Se mixture in the molar ratio of 1:1:3 were treated in a planetary ball mill. The compounds Bi2Se3, BiSe, and BiSbSe3 were formed after short milling periods.The Bi + Se mixture in the molar ratio of 2:1 was less reactive, after 60 min besides the X-ray reflections of Bi, only few weak lines of an unidentified product were observed

[43] FABRICATION OF AL2O3/ZRO2 MICRO/NANO-COMPOSITE PREPARED BY HIGH ENERGY BALL MILLING

Nagashima-M; Maki-K; Hayakawa-M - MATERIALS-TRANSACTIONS. JUN 2001; 42 (6) : 1119-1123

An Al2O(3)-5 vol%ZrO2 micro/nano-composite was successfully fabricated by sintering the high-energy ball milled mixture of commercial Al2O3 powder and zirconium alkoxide. The composite could be sintered to a nearly full density at 1450 degreesC in the ambient atmosphere. The microstructure consisted of the fine dispersions of ZrO2 particles, both intra-granular type of similar to 50 nm and inter-granular type of similar to 0.2 mum, and Al2O3 matrix grains of similar to 0.6 mum. The role of high energy ball milling in the present nano-composite formation was primarily the refinement of the Al2O3 grains and the introduction of strains in them

[42] MECHANISM OF MECHANICAL CRYSTALLIZATION OF AMORPHOUS FE-MO-SI-B ALLOY

Yao-B; Liu-SE; Liu-L; Si-L; Su-WH; Li-Y - JOURNAL-OF-APPLIED-PHYSICS. AUG 1 2001; 90 (3) : 1650-1654.

Crystallization processes of an amorphous (Fe-0.99, Mo-0.01)(78)Si9B13 alloy induced by mechanical milling and annealing at pressures from 0 to 7.0 GPa were studied. It is found that the milling time needed for the crystallization of the amorphous alloy and its crystallization products are related to the milling intensity. The crystallization products are an alpha -Fe(Mo, Si) disordered solid solution at a lower milling intensity, while at a higher milling intensity they are alpha -Fe(Mo, Si), Fe-Si-B, and Fe2B phases. By comparing the mechanical crystallization of the amorphous alloy with its high pressure crystallization, it is suggested that crystallization of the amorphous alloy driven by ball milling results from the simultaneous action of local pressure (4-6 GPa) and local temperature (600-700 K), which are produced by the collision of steel balls. The local pressure decreases the thermodynamic potential barrier of nucleation and increases the diffusion activation energy in the process of mechanical crystallization, leading to that crystallization of amorphous alloy is depressed when the crystallization needs a

long-range atomic diffusion and is promoted when the crystallization needs atomic diffusionless or short-range diffusion. The local temperature plays the same role in the mechanical crystallization as the annealing temperature in the thermal crystallization.

[41] DRIVEN PHASE TRANSFORMATIONS: A USEFUL CONCEPT FOR WEAR STUDIES?

Chaffron-L; Le-Bouar-Y; Martin-G - COMPTES-RENDUS-DE-L-ACADEMIE-DES-SCIENCES-SERIE-IV-PHYSIQUE-ASTROPHYSIQUE. JUL 2001; 2 (5) : 749-759.

The concept of driven alloys is introduced and examples are given for alloys under irradiation or under high energy ball milling. Both real and computer experiments show that the stationary configuration of alloys under external forcing depends on the overall temperature, on the ratio of the ballistic to the thermally activated atomic jump frequency, and on the space and time correlation of the ballistic jumps. As well as temperature, the description of driven phase transformations requires a new control parameter: the intensity of forcing. The latter is shown to be the irradiation flux for alloys under irradiation and the momentum transferred per unit time to an elementary volume of matter, under milling. We show how to use these concepts to address the wear rate of swift train wheels (TGV): it is found that the wear rate is proportional to the intensity of forcing

[40] PHASE TRANSFORMATIONS IN CO-B-SI ALLOYS INDUCED BY HIGH-ENERGY BALL MILLING

Pekala-M; Jachimowicz-M; Fadeeva-VI; Matyja-H - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 360-365.

X-ray diffraction analysis, differential scanning calorimetry and magnetization measurements were used to determine the structural changes of the Co78B11Si11 alloys prepared by a ball milling of amorphous, crystallized ribbons and a mixture of elemental crystalline powders in vibratory mill. For all starting materials the high-energy ball milling of Co78B11Si11 alloy produces a crystalline structure with nanometer sized crystals. The average crystallite size is about 5 nm. Three series of Co78B11Si11 alloys are the ferromagnetic materials. Milling of amorphous alloys causes an increase of the room temperature magnetic moment from 0.90 to 1.08 mu (B). A similar tendency is observed for alloys produced by milling of the initially crystallized ribbons for which the magnetic moment increases from 0.73 mu (B) at t = 0 to 1.17 mu (B) after 250 h. Somewhat different dependence is found for alloys milled from powders since magnetization of the alloy subjected to longer milling is reduced by 10% due to structural disorder introduced during a formation of the crystalline Co(Si,B) phase with nanometer sized crystals.

[39] MAGNETIC AND STRUCTURAL STUDIES OF BALL MILLED FE78B13SI9

Pekala-M; Jachimowicz-M; Fadeeva-VI; Matyja-H; Grabias-A

JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 380-384.

We report on high-energy ball milling of Fe76B13Si9 alloy prepared from amorphous and crystallized ribbons as starting materials as well as from a mixture of pure elemental powders. The X-ray diffraction (XRD), differential scanning calorimetry (DSC), magnetization and Mossbauer measurements were carried out. High-energy ball milling processes form nanocrystalline Fe-based solid solution for all starting materials investigated. The average grain size was in the range 8-16 nm. By mechanical crystallization of amorphous Fe78B13Si9 alloy we obtain two phase mixture of supersaturated alpha - Fe(Si, B) solid solution. The volume fraction of amorphous phase depends on the milling time. In the case of milling crystalline materials (mixture of crystalline powders or crystallized ribbon), continuous refinement of the microstructure was observed. Dissolution of Si and B atoms in Fe lattice during mechanical alloying of elemental powders occurred simultaneously with crystallite size reduction. The grain size reduction to the nanometer range is accompanied by an increase in atomic-level strain. Decreasing of grain size and increasing of the atomic-level strain lead to the decomposition of the Fe2B compound during the milling of the crystallized ribbon. Boron atoms dissolve in the Fe crystalline lattice forming supersaturated alpha -Fe(Si, B) solid solution. Similar effect was observed during prolonged milling of mechanically crystallized ribbon. All the alloys studied are ferromagnetic with Curie temperatures exceeding 850 K independent of a starting materials. The magnetic moments are reduced with increasing milling time. A multiphase composition is also confirmed by Mossbauer spectroscopy.

[38] PREPARATION OF PMN POWDERS AND CERAMICS VIA A HIGH-ENERGY BALL MILLING PROCESS

Kong-LB; Ma-J; Zhu-W; Tan-OK

JOURNAL-OF-MATERIALS-SCIENCE-LETTERS. 2001; 20 (13) : 1241-1243

[37] MECHANICALLY ALLOYED CU-FE STUDIED BY MOSSBAUER SPECTROSCOPY

Principi-G; Spataru-T; Gupta-R; Enzo-S; Kuncser-V; Filoti-G - JOURNAL-OF-ALLOYS-AND-COMPOUNDS. AUG 9 2001; 326 (1-2) : 188-192

Recent studies of mechanically alloyed Fe-Cu powder mixtures have suggested differences in the local magnetic environment of iron atoms. For a more accurate definition of this point, ball-milled Cu70Fe30 and Cu50Fe50 alloys were investigated by Mossbauer spectroscopy in the, temperature range 4.2-300 K. The low temperature Mossbauer spectra exhibit a broad magnetic pattern. typical of a defect structural configuration. The magnetic splitting strongly decreases with increasing temperature, especially in the case of Cu70Fe30 alloy. But even for this composition there is, at room temperature, an unresolved magnetic pattern. Applying a magnetic field of 3 T, parallel to gamma rays, at 4.2 K a rotation of all magnetic moments along the external field is observed. The samples behave as an alloy with continuously distributed local fields

[36] NANOPHASE IRON OXIDES BY BALL-MILL GRINDING AND THEIR MOSSBAUER CHARACTERIZATION

Bid-S; Banerjee-A; Kumar-S; Pradhan-SK; De-UY; Banerjee-D - JOURNAL-OF-ALLOYS-AND-COMPOUNDS. AUG 9 2001; 326 (1-2) : 292-297

Ball-mill grinding of ferric oxide, Fe2O3. to obtain nanophase samples has been undertaken for different duration with repeated X-ray diffraction monitoring of nanophase formation. Particle size and strain have been calculated from XRD patterns, for different periods of ballmilling at 300 rpm. Mossbauer spectra of as-supplied or bulk iron oxides and these finely ballmilled samples have been compared looking for the signature of superparamagnetism possible in the nanophase samples

[35] PHASE EQUILIBRIA AND MICROSTRUCTURE IN SR4FE6-XCOXO13 0 <= X <= 4 MIXED CONDUCTORS

Fossdal-A; Sagdahl-LT; Einarsrud-MA; Wiik-K; Grande-T; Larsen-PH; Poulsen-FW - SOLID-STATE-IONICS. JUL 2001; 143 (3-4) : 367-377.

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The densification, microstructure and phase evolution of Sr4Fe6-xCoxO13 (0 less than or equal to x less than or equal to 4) materials have been investigated by powder X-ray diffraction, electron microscopy and thermal analysis. Powders were prepared by the solid state reaction method or by the EDTA precursor method. Pure Sr4Fe6O13 is stable above 775 +/- 25 degreesC in air until it melts peritectically at 1220 +/- 5 degreesC. Below 775 degreesC, Sr4Fe6O13 is unstable with respect to the formation of Sr1-xFeO3-delta and SrFe12O19. Co substituted Sr4Fe6O13 is only stable in a narrow temperature region near 900 degreesC. At higher or lower temperature, the Co-content is reduced due to formation of the perovskite SrFe1-zCozO3-delta and the solid solutions CO3-yFeyO4 (below 900 degreesC) or Co1-yFeyO (above 900 degreesC). A plate-like morphology of Sr4Fe6-xCoxO13 grains was observed both in calcined powders and in sintered ceramics. Ball milling of the calcined powders was necessary prior to the sintering in order to achieve dense materials in the temperature region 1120-1170 degreesC. Only pure Sr4Fe6O13 appeared as a single-phase material after sintering. Increasing amounts of the phases SrFe1-zCozO3-delta and Co1-yFeyO were observed with increasing sintering temperature and increasing Co-content due to the limited solubility of Co in Sr4Fe6-xCoxO13. The thermal expansion coefficient of the materials deviates from linear behavior due to the decreasing oxidation state of iron with increasing temperature. The present investigation demonstrates that Sr4Fe4Co2O13 materials with high oxygen permeability are not single-phase materials when sintered at high temperature

[34] UPTAKE OF IRON, OXYGEN AND NITROGEN IN MOLYBDENUM DURING BALL MILLING

Lucks-I; Lamparter-P; Mittemeijer-EJ - ACTA-MATERIALIA. AUG 1 2001; 49 (13) : 2419-2428

Molybdenum powder was ball milled in a steel vessel with hardened steel balls under Ar, O-2 and N-2 atmosphere, respectively. The milling products were examined by chemical analysis, X-ray diffraction and neutron diffraction. During milling under Ar or O-2 the iron as well as the oxygen content of the samples increases dependent on the number of interruptions of the milling process. The presence of dissolved oxygen seems to facilitate the solubility of iron in the molybdenum powder. Milling in a nitrogen gas atmosphere results in the formation of a nanocrystalline cubic gamma - Mo2N phase and a Mo-rich amorphous-like grain boundary phase. The microstructural imperfection was characterised by X-ray diffraction-line profile analysis. A method was proposed for the evaluation of the crystallite size and the microstrain in nanocrystalline materials, as well as the amount and structure of disordered grain boundaries from the reduced pair correlation function.

[33] POSSIBLE EFFECTS OF SITE ISOLATION IN ANTIMONY OXIDE-MODIFIED VANADIA/TITANIA CATALYSTS FOR SELECTIVE OXIDATION OF O-XYLENE

Schubert-UA; Anderle-F; Spengler-J; Zuhlke-J; Eberle-HJ; Grasselli-RK; Knozinger-H TOPICS-IN-CATALYSIS. 2001; 15 (2-4) : 195-200

Titania-supported vanadia catalysts were modified by addition of antimony oxide for application in o-xylene selective oxidation to phthalic anhydride. It was shown that active and selective catalysts can be prepared by ball-milling mixtures of powders of TiO2, V2O5 and Sb2O3 followed by calcination. X-ray photoelectron spectroscopy proves the formation of highly dispersed overlayers of vanadium oxide and antimony oxide, in which V5+ is partially reduced to lower oxidation states and Sb3+ is partially oxidized to Sb5+. Antimony oxide segregated into the outermost surface layers. It is therefore inferred that the presence of the antimony oxide modifier spatially separates V-O species and leads to "site isolation" which may be responsible for the positive effect of the modifier for the catalyst's selectivity

[32] MOSSBAUER STUDY OF PRODUCTS OF LOW ENERGY MILLED FE30SI70

Li-YZ; Zhu-CH; Zhu-SY; Zhou-G JOURNAL-OF-PHYSICS-CONDENSED-MATTER. JUL 2 2001; 13 (26) : 6019-6029

Measurements of x-ray diffraction pattern and Mossbauer spectra show that beta -FeSi2 is produced in an Fe30Si70 powder sample by low energy ball milling, and its proportion increases step by step as the milling time increases until the milling time reaches 60 h; after that this solid reaction reaches saturation. Within the final products, there is over 90% beta -FeSi2 and a little Fe and Si remnants. The remnant Fe exists in two forms: one is powder and the second is enveloped by beta - FeSi2. When using hydrochloric acid to treat the as-milled sample, the first form of Fe is removed but the second form of Fe still remains. When the sample is annealed at 600 degreesC, the proportion of beta -FeSi2 is close to 99% in the final products.

[31] ELABORATION AND STRUCTURE OF NANOSTRUCTURED TIC: A XRD AND HRTEM STUDY

Baviera-P; Harel-S; Garem-H; Grosbras-M - SCRIPTA-MATERIALIA. JUN 8 2001; 44 (12) : 2721-2727

[30] MECHANICAL PROPERTIES OF HOT ISOSTATICALLY PRESSED NANOGRAIN IRON AND IRON ALLOY POWDERS

Munitz-A; Fields-RJ -POWDER-METALLURGY. 2001; 44 (2) : 139-147. PY:

Hot isostatic pressing (hipping) was performed on a variety of iron and iron alloy powders produced by attrition ball milling. Microhardness and compression tests were used to determine the mechanical properties. Fracture morphology was studied by scanning electron microscopy. For each specific alloy, increasing the hipping temperature causes an increase in density up to a maximum. Hipping at still higher temperatures improves the bonding without any change in density. The minimum temperature required for obtaining the maximum density depends on the initial powder composition. While iron powder processed in argon (Fe [Ar]) reached a maximum density at 580 degreesC, an identically processed iron carbon alloy (Fe-2C [N]) reached its maximum density above 850 degreesC. Two types of compression strain-stress curves were obtained: up to a certain temperature, most powders showed an increase in compression yield stress with temperature. Hipping above this point causes a decrease in the compression yield stress, and an increase in elongation. This behaviour is entirely different than that of a stainless steel powder (Fe-18Cr-8Ni), which shows substantial work hardening for hipping temperatures ranging between 965 and 1050 degreesC.

[29] EFFECT OF HIGH ENERGY BALL MILLING ON SOLID STATE REACTIONS IN AL-25 AT.-%NI POWDERS

Ying-DY; Zhang-DL - MATERIALS-SCIENCE-AND-TECHNOLOGY. JUL 2001; 17 (7) : 815-822.

The effect of high energy ball milling on the solid state reactions between aluminium and nickel in Al-25 at.-%Ni powders has been investigated using scanning electron microscopy, thermal analysis techniques, and X-ray diffractometry. It has been observed that the microstructure of the powder particles evolves in three stages: stage I is the formation of entrapped nickel particles in the aluminium matrix structure; stage II is the formation of an Al-Ni multilayered structure; and stage III is the formation of Al3Ni single phase. The temperature required to activate the reaction between aluminium and nickel during

heating decreases by more than 200 K as the powder particle microstructure evolves from the entrapped particle structure to the multilayered structure, and then it decreases gradually with decreasing nickel layer thickness. The nucleation and lateral growth of Al3Ni phase at the Al/Ni interfaces occurs at much lower temperatures than those required for the transverse growth of Al3Ni. The fraction of Al3Ni formed through nucleation and lateral growth at the interface is almost linearly proportional to the interfacial area. The activation energy for nucleation and lateral growth of Al3Ni at the Al/Ni interfaces is independent of nickel layer thickness, but the activation energy for transverse growth of AIN decreases substantially with decreasing nickel layer thickness. The latter is attributed to the observation that the nickel layers are thinned by plastic deformation and thus contain an increasingly higher density of dislocations.

[28] INFLUENCE OF THE MILLING CONDITIONS ON THE AMORPHIZATION OF FE82NB6B12 ALLOY

Caamano-Z; Perez-G; Zamora-LE; Surinach-S; Munoz-JS; Baro-MD - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 15-19.

Fe82Nb6B12 alloy was synthesized from the elemental powders by a planetary high-energy ball mill, at room temperature, using different milling times and different surfactants. The products were measured by X-ray diffraction, magnetic thermogravimetry, vibrating sample magnetometer, and Mossbauer spectroscopy. Amorphization was observed from the X-ray diffraction on a sample ball milled for about 220 h using 595 rpm and cyclohexane as surfactant. Nevertheless, using the same conditions without surfactant, only the bcc Fe was found. The results are compared with data for rapidly quenched materials. (C) 2001 Elsevier Science B.V. All rights reserved. CC: Physical-Chemical-and-Earth-Sciences UD: 200136 *LHM: Commander par : FORM@INIST

[27] STRUCTURAL AND MAGNETIC INVESTIGATION OF MECHANICALLY ALLOYED FE80CO5(NBXZR1-X)(7)B-8 POWDERS

Chiriac-H; Moga-AE; Urse-M; Hison-C - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 50-54.

Experimental results concerning the structural and soft magnetic properties of nanocrystalline Fe80Co5(NbxZr1-x)(7)B-8 (x = 0.3, 0.4 and 0.5) powders obtained by high-energy ball milling of elemental powders in argon atmosphere are reported in this work. The initially crystalline diffraction lines corresponding to the unmilled Fe80Co5(NbxZr1-x)(7)B-8, (x = 0.3, 0.4 and 0.5) powders are considerably broadened after ball milling due to the reduction of the crystal sizes and increase of internal strains. The average crystallite sizes, measured by X-ray diffractometry using the Warren-Averbach method, in the final samples obtained after 250 h ball milling were between 7.5 and 11.4 nm. A change in the magnetic properties, measured by vibrating sample magnetometry, of Fe80Co5(NbxZr1-x)(7)B-8, (x = 0.3, 0.4 and 0.5) mechanically alloyed powders is obtained after the thermal treatment of the samples at temperatures between 100 degreesC and 400 degreesC, for 1 h, due to strain relaxation which was measured by X-

[26] LOCAL STRUCTURAL ORDERS IN NANOSTRUCTURED FLUORIDE POWDERS

Guerault-H; Bureau-B; Silly-G; Buzare-JY; Greneche-JM - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 65-69.

Nanostructured fluoride powders were prepared by high-energy ball milling under different milling conditions (time and intensity). To investigate the local structural orders, we combined suitable local probe techniques such as Fe-57 Mossbauer spectrometry (MS) and F-19, Ga-69 and Ga-71 nuclear magnetic resonance (NMR) applied to FeF3 and GaF3 milled samples, respectively. Both isomer shifts and chemical shifts are consistent with the presence of only corner-sharing octahedral units in these systems. After analysis of the different hyperfine magnetic and quadrupolar parameters, the corresponding Mossbauer and nuclear magnetic resonance data were compared to those of crystalline and amorphous phases and then mutually compared. Two types of local structural orders are unambiguously detected and attributed to the presence of crystalline grains and grain boundaries (GB

[25] STRUCTURAL AND MAGNETIC PROPERTIES OF MECHANICALLY ALLOYED (FE0.5MN0.5)(X)CU100-X NANOCRYSTALLINE COMPOUNDS

Alocen-MC; Crespo-P; Hernando-A; Gonzalez-JM - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 268-271. FTXT: ScienceDirect (tm) PY: 2001 IS: 0022-3093 AB: We have produced samples with nominal composition (Fe0.5Mn0.5)(20)Cu-80 (at.%) by high-energy ball milling. A structural analysis was undertaken by means of X-ray diffraction (XRD). For milling times around 200 h, the reflections of crystalline Fe cannot be resolved and a single fcc phase is observed, having a lattice parameter larger than fcc-Cu. The grain size is 30 nm. The magnetic properties of the alloy which we observed are: (i) it has coercivities of the order of 25 mT, (ii) susceptibility in a field of 5 T shows that the alloy is polarizable, (iii) low field temperature dependence of the magnetization measured after zero field cooling (ZFC) and field cooling (FC) shows the simultaneous occurrence of two types of magnetic order with differing relaxation times. On the basis of the structural information available, we tentatively identify those types of magnetic order as corresponding to a cluster glass involving both Fe and Mn atoms and to a canonical spin glass

[24] MICRO- AND MACROSCOPIC MAGNETIC STUDY OF THE DISORDERING (BALL MILLING) AND POSTERIOR REORDERING (ANNEALING) OF FE-40 AT.% AL

Amils-X; Garitaonandia-JS; Nogues-J; Surinach-S; Plazaola-F; Munoz-JS; Baro-MD - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 272-276.

The paramagnetic-ferromagnetic transition of Fe-40 at.% Al during ball milling, from 0 to 72 h, (disordering process) and the posterior ferromagnetic-paramagnetic transition with subsequent annealing, from T-ANN = 300 to 975 K, (reordering process) were studied by magnetization and Mossbauer spectroscopy to understand the differences between local and average properties in nanometric systems. The overall properties observed from both techniques are similar despite the atomic scale data of Mossbauer spectroscopy and macroscopic properties measured by magnetization, respectively. The differences between both types of results, e.g., 10-20% larger paramagnetic contribution or 10-20% smaller normalized hyperfine field - magnetization observed from Mosbauer spectroscopy, are a consequence of the microscopic-macroscopic length scales of each technique and the limitations of the data analysis

[23] COMPARISON OF FE-NI-P-SI ALLOYS PREPARED BY BALL MILLING

Sunol-JJ; Clavaguera-N; Clavaguera-Mora-MT - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 114-119

Fe-Ni-P-Si alloys were synthesized from powders in a planetary ball-mill. The microstructure and thermal properties of the milled powders were measured by X-ray diffraction, scanning electron microscopy and differential scanning calorimetry. The diffraction peaks of the individual powders are not detected after the first 32 h of milling time. During milling amorphous and amorphous-like phases are formed. Differential scanning calorimetry results show exothermic reactions for all of the compositions indicating a recovery process as well as crystallization of the amorphous phase. The crystallization products are compared to starting powders. The use of Fe and Ni in the alloy reduces both the energy of formation of the amorphous phase and the time necessary to produce this phase. The incorporation of Si into the Fe-Ni-based alloy favors the formation of a more stable amorphous phase. Moreover, the use of Fe3P as starting powder increases the time to form the amorphous phase. The larger the Si content, the greater the thermal stability of the amorphous phase produced during mechanical alloying.

[22] MECHANICALLY ALLOYED LOW-NICKEL AUSTENITE FE-NI PHASE: EVIDENCE OF SINGLE-PHASE PARAMAGNETIC

Kaloshkin-SD; Tcherdyntsev-VV; Baldokhin-YV; Tomilin-IA; Shelekhov-EV - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 329-333

Fe100-xNix alloys were obtained by a mechanical alloying technique (MA) from elemental metals. The alloys consist of: single body-centered cubic phase (bcc) at nickel concentrations less than or equal to 22 at.%, single face-centered cubic phase (Fcc) - at x > 28 at.% and two of these phases - at 22 less than or equal to x less than or equal to 28 at.%. Annealing results in formation of single fcc phase structure in the samples with x greater than or equal to 22 at.%. According to the Mossbauer spectrometry data these annealed alloys with 22-28 at.% Ni were not ferromagnetic at room temperature. Cooling austenitic samples in liquid nitrogen as well as mechanical deformation stimulated austenite-marten site transformation accompanied by the appearance of ferromagnetism.

[21] MAGNETIC AND STRUCTURAL STUDIES OF BALL MILLED FE78B13SI9

Pekala-M; Jachimowicz-M; Fadeeva-VI; Matyja-H; Grabias-A - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. JUL 2001; 287 (1-3) : 380-384

We report on high-energy ball milling of Fe76B13Si9 alloy prepared from amorphous and crystallized ribbons as starting materials as well as from a mixture of pure elemental powders. The X-ray diffraction (XRD), differential scanning calorimetry (DSC), magnetization and Mossbauer measurements were carried out. High-energy ball milling processes form nanocrystalline Fe-based solid solution for all starting materials investigated. The average grain size was in the range 8-16 nm. By mechanical crystallization of amorphous Fe78B13Si9 alloy we obtain two phase mixture of supersaturated alpha - Fe(Si, B) solid solution. The volume fraction of amorphous phase depends on the milling time. In the case of milling crystalline materials (mixture of crystalline powders or crystallized ribbon), continuous refinement of the microstructure was observed. Dissolution of Si and B atoms in Fe lattice during mechanical alloying of elemental powders occurred simultaneously with crystallite size reduction. The grain size reduction to the nanometer range is accompanied by an increase in atomic-level strain. Decreasing of grain size and increasing of the atomic-level strain lead to the decomposition of the Fe2B compound during the milling of the crystallized ribbon. Boron atoms dissolve in the Fe crystalline lattice forming supersaturated alpha -Fe(Si, B) solid solution. Similar effect was observed during prolonged milling of mechanically crystallized ribbon. All the alloys studied are ferromagnetic with Curie temperatures exceeding 850 K independent of a starting materials. The magnetic moments are reduced with increasing milling time. A multiphase composition is also confirmed by Mossbauer spectroscopy

[20] AMORPHOUS AND NANOCRYSTALLINE (FE0.5CO0.5)(60)CU2V8B30 PREPARED BY MECHANICAL ALLOYING

Ji-YL; Wang-GH; Li-F; Wang-GQ; Zhao-JW; Zhang-SY - JOURNAL-OF-MATERIALS-SCIENCE-LETTERS. 2001; 20 (13) : 1267-1269

[19] CRYSTALLIZATION TEMPERATURE AND ACTIVATION ENERGY OF RF-SPUTTERED NEAR-EQUIATOMIC TINI AND TI50NI40CU10 THIN FILMS

Chen-JZ; Wu-SK - JOURNAL-OF-NON-CRYSTALLINE-SOLIDS. AUG 2001; 288 (1-3) : 159-165

Amorphous thin films of Ti49.93Ni50.07 and Ti49.96Ni40.09Cu9.95 alloys were rf-sputtered onto a (100) Si-wafer and characterized by X-ray diffraction (XRD), DSC, and Auger electron spectrometer (AES) tests. The amorphous structure of the T49.93Ni50.07 films is found to be similar to that of TiXNi1-X rapidly quenched ribbons and mechanically alloyed powders, but more stable than Ti49.09Ni40.09Cu9.95 films, by comparing the wavenumbers (Q(P)) of the broad XRD peaks. The crystalline activation energy, E-a, and the onset crystallization temperature, T-X, for a 30 degreesC/min DSC heating rate of the Ti49.96Ni40.09Cu9.95 and Ti49.93Ni50.07 films are 388 kJ/mol, 488 degreesC, and 416 kJ/mol and 511 degreesC, respectively, This also suggests that the amorphous Ti49.96Ni40.09Cu9.95 thin film is less stable than the Ti49.93M50.07 film, and can be explained in terms of the enthalpy of mixing. The Tx values of amorphous TiXNi1-x materials fabricated by the sputtering technique, by rapid quenching and by mechanical alloying are also compared and discussed.

[18] SITE PREFERENCE DETERMINATION IN INTERMETALLIC COMPOUNDS BY THERMAL CONDUCTIVITY MEASUREMENT

Terada-Y; Ohkubo-K; Mohri-T; Suzuki-T - JOURNAL-OF-MATERIALS-RESEARCH. AUG 2001; 16 (8) : 2314-2320

A method for the determination of site preference of substitutional elements in intermetallic compounds is proposed. It is demonstrated in Ni3Al-X alloys that the ridge direction in thermal conductivity contours in the ternary gamma' phase agrees with that of the solubility lobe of the gamma' phase in ternary phase diagrams. The ridce direction is a reliable indication of site preference of substitutional elements in intermetallic compounds. The present method is conveniently applied to a normal polycrystalline specimen with small size, and therefore, a versatile class of brittle compounds can be studied.

[17] THE STUDY ON THE ELECTROCHEMICAL PERFORMANCE OF MECHANICALLY ALLOYED MG-TI-NI-BASED TERNARY AND QUATERNARY HYDROGEN STORAGE ELECTRODE ALLOYS

Zhang-Y; Zhang-SK; Chen-LX; Lei-YQ; Wang-QD - INTERNATIONAL-JOURNAL-OF-HYDROGEN-ENERGY. AUG 2001; 26 (8) : 801-806

In this paper, ternary Mg50-xTixNi50 (x = 5,10,15) and quaternary Mg35Ti10M5Ni50 (M = Y,AI,Zr) magnesium-based hydrogen storage electrodes prepared by means of mechanical alloying (MA) were investigated. Through X-ray diffractometer (XRD) and scanning electron microscope (SEM) investigation, the phase structure transformation and

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morphology of Mg35Ti15Ni50 during MA process were examined. The effects of Ti content on discharge capacity, the cycling life and high rate dischargeability of the ternary Mg-Ti-Nli electrode alloys were studied in the discharge tests. It was found that as the Ti content increased the cycling stability of Mg50-xTixNi50 alloys improved but the discharge capacity and high rate discharge-ability both decreased. The MA quaternary Mg35Ti10M5Ni50 (M = Y,AI,Zr) alloys had significantly longer cycling life but lower discharge capacity than the ternary alloy Mg35Ti15Ni50. Surface coating of alloy particles with Ni was also tested for improving the cycling stability of the ternary alloys and found beneficial for cycling stability and bad for discharge capacity

[16] COMPRESSIVE MECHANICAL PROPERTIES OF MG-TI-C NANOCOMPOSITE SYNTHESISED BY MECHANICAL MILLING

Hwang-S; Nishimura-C; McCormick-PG - SCRIPTA-MATERIALIA. MAY 25 2001; 44 (10) : 2457-2462

[15] FORMATION AND STRUCTURE OF HIGHLY OVER-STOICHIOMETRIC LANI5+X (X SIMILAR TO 1) ALLOYS OBTAINED BY MANIFOLD NON-EQUILIBRIUM METHODS

Cuevas-F; Latroche-M; Hirscher-M; Percheron-Guegan-A - JOURNAL-OF-ALLOYS-AND-COMPOUNDS. JUL 12 2001; 323 : 4-7

Highly over-stoichiometric LaNi5+x (x similar to1) alloys have been obtained by distinct non-equilibrium preparation routes: ageing of amorphous La-Ni films, melt spinning and mechanical alloying. These alloys are metastable and exhibit a TbCu7-type structure. Refinement of X-ray diffraction data show that overstoichiometry is achieved by a random substitution of some La atoms by c-axis oriented Ni dumbbells followed by a relaxation of basal Ni atoms towards the dumbbell position. Annealing of LaNi5+x (x similar to1) alloys at moderated temperatures (similar to 800 K) produces precipitation of the secondary Ni phase as dictated by the La-Ni equilibrium phase diagram. We propose that metastable La-Ni alloys with TbCu7-type structure are formed when the atomic mobility in the system is low enough to prevent the diffusion of Ni atoms towards Ni-precipitation centers. The possibility of preparing these compounds by mechanical alloying enables their production on a large scale for possible industrial applications

[14] SMCO5/CU PARTICLES ELABORATION USING A SUPERCRITICAL FLUID PROCESS

Pessey-V; Mateos-D; Weill-F; Cansell-F; Etourneau-J; Chevalier-B - JOURNAL-OF-ALLOYS-AND-COMPOUNDS. JUL 12 2001;

Supercritical fluids exhibit a range of unusual properties that can be exploited for developing new processes. Thus, a new way for particles coating is presented. It consists of depositing on a core particle a thin layer of copper. The core particles are made of ground SmCo5. The evolution of the magnetic properties of SmCo5 is studied as a function of the milling time. The copper source is the copper hexafluoroacetylacetonate (Cu(hfa)(2).H2O), which is thermally decomposed in a supercritical medium. Then, the influence of the copper layer is evaluated. This process obtains new 'core-shell structures' as SmCo5/Cu. New interesting properties are expected for these structures more particularly in the magnetic recording field

[13] CHARACTERISTICS OF MECHANICAL ALLOYING OF ZN-AL-BASED ALLOYS

Zhu-YH; Hernandez-AP; Lee-WB - ZEITSCHRIFT-FUR-METALLKUNDE. JUN 2001; 92 (6) : 578-583

Three pure elemental powder mixtures of Zn-22%Al-18%Cu, Zn-5%Al-11%Cu, and Zn-27%Al-3%Cu (in wt.%) were mechanically alloyed by steel-ball milling processing. The mechanical alloying characteristics were investigated using X-ray diffraction, scanning electron microscopy, and transmission electron microscopy techniques. It was explored that mechanical alloying started with the formation of phases from pure elemental powders, and this was followed by mechanical milling-induced phase transformation. During mechanical alloying, phases stable at the higher temperatures formed at the near room temperature of milling. Nano-structure Zn-Al-based alloys were produced by mechanical alloying.

[12] PHASE TRANSFORMATION OF A DUAL PHASE AL-FE ALLOY PREPARED BY MECHANICAL ALLOYING

Zhou-F; Luck-R; Lu-K; Ruhle-M - ZEITSCHRIFT-FUR-METALLKUNDE. JUL 2001; 92 (7) : 675-681

A metastable Al90Fe10 (at.%) alloy, composed of a supersaturated solid solution of face-centred cubic (fcc) Al(Fe) and an amorphous phase matrix, was prepared by mechanical alloying of a mixture of Al and Fe elemental blends. The thermally induced microstructural evolution in the dual phase alloy was characterized by X-ray diffraction, transmission electron microscopy, differential scanning calorimetry, and magnetothermal analysis. On continuous heating two stages of solid state phase transformation occurred: (i) a polymorphous crystallization of the amorphous phase to a metastable crystalline Al6Fe that structurally stabilizes over a temperature range of about 200 K, and (ii) a eutectoid decomposition of the crystalline Al6Fe into the equilibrium phases of Al13Fe4 and fcc Al(Fe). Thermodynamic and kinetic analyses of the observed phase transformation processes were given. The formation of the dual phase alloy in the as-milled state and the phase transitions can be illustrated by a hypothetical free energy diagram, implying the dual phase structure facilitates the polymorphous crystallization of Al6Fe

[11] INFLUENCES OF OXIDE PHASES ON THE COERCIVITY OF MECHANICALLY ALLOYED MULTICOMPONENT FE-BASED AMORPHOUS ALLOYS

Liu-YJ; Chang-ITH; Lees-MR - SCRIPTA-MATERIALIA. JUN 8 2001; 44 (12) : 2729-2734

[10] THE INVARIANT LAWS OF THE AMORPHIZATION PROCESSES BY MECHANICAL ALLOYING - I. EXPERIMENTAL FINDINGS

Delogu-F; Schiffini-L; Cocco-G - PHILOSOPHICAL-MAGAZINE-A-PHYSICS-OF-CONDENSED-MATTER-STRUCTURE-DEFECTS-AND-MECHANICAL-PROPERTIES. AUG 2001; 81 (8) : 1917-1937. FTXT: InformationQuest PY: 2001 IS: 0141-8610 AB: Several Ti-, Zr-, Hf- and Nb-based alloys were synthesized using differing milling regimes. Metastable phases, either crystalline or amorphous, develop from the parent elements according to a general sigmoid-shaped behaviour ruled by an interface-controlled kinetic mechanism. The extent of the alloying reactions was related to the operating variables, experimentally determined in the course of the process. Although the transformation rates depended on the milling intensity, that is on the impact energy times the impact frequency, it was found that the reaction yield, defined by the ratio of the transformed fraction to the specific energy dose, is an invariant quantity characteristic of each system. The specific energy dose defines the mechanical work done on the system per mass unit of the reactants. A rationale for the observed behaviours was provided by the energy needed to reach a given level of the reactant dispersion. Ruling the total extent of the grain boundary area, and the overall kinetics of the alloying process, the work expended in the microstructure refinement was found to be another invariant property of the treated mixtures. The reaction yield is the reference parameter

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to compare milling trials on an absolute basis, so providing an opportunity towards a quantitative understanding of the mechanical alloying processes.

[9] MORPHOLOGY-FREE PROCESSING OF MAGNESIUM ALLOYS

Kondoh-K; Luangvaranunt-T; Aizawa-T - MATERIALS-TRANSACTIONS. JUL 2001; 42 (7) : 1254-1257

To establish the solid-state recycling technology of remarkably inflammable magnesium alloys, Bulk Mechanical Alloying (BMA) process based on the cyclic plastic deformation has been applied to demonstration experiment. Even starting from large machined chips of AZ91D alloys as starting materials, microstructures of original AZ91D can be refined in the solid state via BMA. Much lower energy consumption is necessary for this solid state recycling compared to the conventional casting process. BMA is one of the suitable recycling technologies to be morphology-free from starting materials

[8] NON-EQUILIBRATION OF NANOSTRUCTURED MG2NI BY BULK MECHANICAL ALLOYING

Aizawa-T; Kuji-T; Nakano-H - MATERIALS-TRANSACTIONS. JUL 2001; 42 (7) : 1284-1292

Bulk mechanical alloying was successfully applied to solid-state synthesis of Mg2Ni, which is a promising hydro gen storage alloy. Through XRD, TEM and PCT measurement, the synthesized product was characterized to be a single-phase Mg2Ni, excluding co-synthesized MgNi2 or residuals of nickel or magnesium as in conventional processing. The synthesized Mg2Ni has a fine microstructure with the grain size of 10-20nm. Thermodynamic data for hydride formation are coincident with reference data, so that nano-structuring in the solid-state synthesized, stoichiometric Mg2Ni has little role to make essential change in hydrogen storage capacity and mechanism. Physical modification by enrichment of nickel via the bulk mechanical alloying enables us to obtain the nickel-enriched, nano-structured Mg2Ni and to demonstrate the phase transformation of Mg2NiH4 takes place from high temperature phase (HT-phase) to low temperature phase (LT-phase) with decreasing the holding temperature. Negative shift of formation entropy of Mg2NiH4 from HT-phase to LT-phase is corresponding to the hydrogen ordering, where a part of octahedral vacancy sites in Mg Ni structure is only occupied by hydrogen atoms. Formation of LT-phase is also verified by XRD analysis working together with PC7 measurement. Positive shift of formation enthalpy of Mg2NiH4 from HT-phase to LT-phase drives a significant increase of plateau pressure in the PCT diagram. Non-equilibration of nano-structured Mg2Ni leads to control of hydride formation process. Use of these non-equilibrium phase materials helps us to understand various unknown properties of metal hydrides.

[7] GAS NITRIDING OF MAGNESIUM-TITANIUM ALLOYS FABRICATED BY BULK MECHANICAL ALLOYING

Luangvaranunt-T; Visuttipitukul-P; Kondoh-K; Kuwahara-H; Aizawa-T - MATERIALS-TRANSACTIONS. JUL 2001; 42 (7) : 1312-1316. PY: 2001 IS: 1345-9678 AB: Mg-Ti alloys and pure Mg were successfully gas nitrided at 723 K for 129.6 ks under 0.1 MPa N-2. Ti was selected as alloying element due to its high nitrogen affinity. Fine Ti particles in 10 mum range were homogeneously distributed in the alloys. Bulk Mechanical Alloying process was used to produce the sample having activated state of Mg, providing high diffusion path for nitrogen. Mg3N2 produced is not stable and reacts with moisture, resulting in fine powders of Mg(OH)(2) on the surface and NH3(g) as byproduct.

[6] PREPARATION OF SIC DISPERSED FE0.98CO0.02SI2 BY PRESSURELESS SINTERING WITH CU AND SI ADDITION AND ITS THERMOELECTRIC PERFORMANCE

Ito-M; Nagai-H; Katsura-T; Katsuyama-S; Majima-K - MATERIALS-TRANSACTIONS. JUL 2001; 42 (7) : 1451-1457. PY: 2001 IS: 1345-9678 AB: The SiC-dispersed beta -FeSi2 compounds were synthesized by pressureless sintering with Cu and Si addition without a subsequent heat treatment for phase beta formation. The effects of Cu and Si addition on the phase transformation, sintering behavior, and thermoelectric performance of these samples were investigated. Cu addition significantly accelerated the beta phase formation during the pressureless sintering, and the samples with Cu were mostly composed of the beta phase with a small amount of the residual alpha and epsilon phases. Cu addition was effective for densification; Cu-Si liquid phase formation resulted in a high relative density of over 90%. The thermoelectric power and thermal conductivity of the pressurelessly sintered samples with Cu addition were quite lower and higher, respectively, than those of the hot-pressed sample. The differences were caused by a larger amount of metallic phases, such as the epsilon and Cu-Si phases. The figure of merit of these samples was about 1/3 of that of the hot-pressed sample, indicating that Cu addition completely ruined the enhancement of thermoelectric performance obtained by SiC dispersion. The addition of Si to the samples with Cu decreased the amount of the metallic epsilon phase and increased the amount of the semiconducting phase beta through the reaction epsilon + Si --> beta. The thermoelectric power and thermal conductivity of the samples with Cu were markedly improved by Si addition, which resulted in a significant increase in the figure of merit. The values of the figure of merit for the samples with Cu and Si addition were almost the same as that of the hot-pressed sample with SiC dispersion.

[5] NEW AL-MG-LI-C DISPERSION STRENGTHENED ALLOY - PART 1 - COMPOSITION AND PROCESS DEVELOPMENT

Vine-WJ; Pitcher-PD; Tarrant-- MATERIALS-SCIENCE-AND-TECHNOLOGY. JUL 2001; 17 (7) : 802-806

New fine grained aluminium - magnesium - lithium - carbon alloys, produced by mechanical alloying/powder metallurgy techniques, have been developed. The alloys are suitable for use in the as forged (Tl) condition. A preferred chemistry (Al-5.2Mg-1.3Li-0.35%C, wt-%) has been defined, and methods for production of bulk (50 kg) billets and open die uniaxial forgings have been examined. These have produced attractive mechanical properties (0.2%,PS = 441 MPa, UTS = 501 MPa and K-1C = 23 MPa m(1/2)) without recourse to cold compression. The new alloy is differentiated from AA 5091 by its much lower C content, and by being enriched in magnesium, which provides improved fracture toughness and superior powder handling ability. The balance of properties, achievable in a lightweight, non-heat-treatable alloy, make the alloy a candidate for aerospace, and other applications.

[4] SOLID STATE RECYCLING FROM GREEN WASTES TO ALUMINUM ALLOYS WITH HIGH MATERIAL EFFICIENCY

Aizawa-T; Luangvaranunt-T; Kondoh-K - JOURNAL-OF-THE-JAPAN-INSTITUTE-OF-METALS. JUL 2001; 65 (7) : 581-588

All recyclable materials such as the used mechanical parts or home-housing members are melt, solidified and wrought to down-graded materials in the conventional recycling. Solid-state recycling is a promising approach to accept the mechanical chips and wastes generated in production as input and to yield the upgraded alloys and compounds as output. This new approach requires innovative processing to fabricate the targeting products via in-process refinement and control of

microstructure as needed from the product design. In the present paper, the bulk mechanical alloying process is used for solid state recycling to make microstructure refinement from the mechanical chips to a dense powder compact. In experiment, Al-Si system is employed as a typical material for automotive parts, which must satisfy the requirement of fine Si-particulate size in the final product. Together with refinement experiment, the plastic power history imposed to a sample is continuously monitored during bulk mechanical alloying to be compared with the total energy consumption in the commercial production line from atomizing process to preliminary sintering. The number of cycles required to attain the largest Si-size demand of 7 mum was only 100, so that the energy consumption could be reduced from that needed by the conventional powder metallurgy process working in industry. The present method is robust in processing even when varying the morphology and Si concentration in the input materials

[3] SYNTHESIS OF NANOCRYSTALLINE NBAL3 BY MECHANICAL AND FIELD ACTIVATION

V. Gauthier, F. Bernard, E. Gaffet, Z.A. Munir, J.P. Larpin - Intermetallics 9(2001) 571 - 580

The mechanically - activated, field - activated, and pressure - assisted synthesis (MAFAPAS) process, which combines the simultaneous synthesis and densification of nanophase materials, was utilized to produce nanocrystalline NbAl3 material from Nb + 3Al mechanically activated powders. Nb + 3 Al elemental powders were co - milled for a short time in a specially designed planetary mill to obtain nanoscale distributed reactants but to avoid the formation of any product phases. These were then subjected to high AC currentss (1500 - 1650 A) and uniaxial pressures (56 - 84 MPa). Under these conditions, a reaction is initiated by field activation and completed within a short period of time (3 - 6 min). Using XRD analyses, the MAFAPAS end - product was identified as NbAl3. Back - scattered electron SEM observations coupled with EDXS analyses showed the presence of small amounts of alumina precipitates together with unreacted niobium in the NbAl3 matrix. The end - product relative density ranged from 85 to 96 %. The NbAl3 crystallite size, determined by XRD line - broadening analysis using the Langford method, was in the range of 57 - 150 nm.

[2] TEXTURE AND MICROSTRUCTURE IN VERY FINE GRAIN AL - AL3TI ALLOYS OBTAINED BY EXTRUSION OF MECHANICALLY ALLOYED POWDERS

S. Lehnard, K. Helming, C.P. Chang, F. Wagner, T. Grosdidier - Materials Science and Technology, 17(1) (2001) 1 - 5

Texture has been investigated in warm extruded Al - Al3Ti bars obtained from mechanically alloyed powders. The influence of various high volume fractions of Al3Ti phase (9, 18 and 27 vol. %) and the very fine grain sizes that can be obtained via the mechanical alloying processing route is described. Increasing the volume fraction of Al3Ti tends to decrease the anisotropy of the extruded product. The conventional aluminium texture characterized by a predominant <111>Al fibre usually present in extruded bars is replaced at high volume fraction of Al3Ti particles (27%) and small size of aluminium grains (300 nm) by a weak and broad <441>Al fibre. This is suggested to be associated with a modification of the predominant deformation mechanism, changing from dislocation slip towards grain boundary sliding at small grain size.

[1] ALKYLATION REACTIONS OF POTASSIUM CARBOXYLATES SUPPORTED ON ALUMINA: COMPARISON BETWEEN BALL-MILLING, IMPREGNATION AND DISPERSION PROCEDURES

Michel Gasgnier , Henri Szwarc, Alain Petit, Jean Nahmias and André Loupy - J. Chem. Soc., Perkin Trans. 2, 2001, (7), 1233 - 1238

Potassium carboxylate alkylation by n-bromooctane on neutral alumina in dry media" under microwave irradiation was studied for different methods of preparation of salt–support powder. Mechanical milling and impregnation techniques led to equivalent yields, much higher than those obtained through dispersion. The first method avoids using solvents and subsequent drying of powders. Crystallographic and granulometric studies of the resulting powders were performed to ascertain the results.

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COMMUNIQUE DE PRESSE : Un rhéomètre pour l'évaluation des propriétés d'écoulement de la poudre

Ce rhéomètre, breveté en Grande-Bretagne, permet de résoudre bon nombre des problèmes associés au traitement de la poudre humide et sèche dans les domaines de la recherche, du développement et de la production.

Grâce à un principe des plus novateurs, le **rhéomètre à poudre FT3 de Freeman Technology** évalue les propriétés d'écoulement des poudres et des semi-solides. De fait, la fluidité se mesure à la quantité d'énergie requise pour induire un état d'écoulement dynamique. Ainsi, avec le FT3, les mesurages peuvent être répétés quasiment à l'infini et les procédures d'essai et d'analyse sont automatisées, d'où un gain de temps précieux et l'absence de toute intervention humaine.

Le traitement des poudres se révèle souvent être une opération ardue, en raison des nombreux facteurs qui influent sur les propriétés d'écoulement, comme la vitesse de coulée, la compaction, la ségrégation, l'attrition, l'adhésivité et la fluidification. Or, le rhéomètre à poudre FT3 est capable de classer les poudres en mesurant la dépendance de leur fluidité vis-à-vis de chacun de ces facteurs.

Le mesurage de la fluidité est généralement compliqué par les variations observées en termes de tassement. La solution apportée par le FT3 à ce problème est un procédé de conditionnement, qui produit une densité de tassement uniforme et reproductible préalablement aux essais de fluidité. Il est ainsi possible de comparer, de façon parfaitement fiable, des mesures prises à différents moments et en différents lieux.

Outre les essais programmés, des routines d'homogénéisation entièrement programmables peuvent être conçues en vue d'homogénéiser des poudres sèches ou des mélanges poudre-liquide, voire des matières plus complexes encore, telles la farine et l'eau. Grâce à ces routines, des programmes complexes peuvent être définis de bout en bout et, le cas échéant, répétés à volonté. Une analyse énergétique complète du programme d'homogénéisation est également possible.

Les applications du FT3 sont diverses, depuis les études de formulation en recherche et développement (R&D) jusqu'à l'évaluation des effets d'attrition dans un procédé de fabrication donné, en passant par la définition de critères de fluidité aux fins du contrôle qualité (CQ). Et ces applications présentent de grands avantages puisqu'elles permettent, entre autres, de réduire les délais d'élaboration des produits nouveaux, de limiter le nombre des arrêts de production et d'améliorer le contrôle de la qualité des matières premières comme des produits finis.

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