RESEAU FRANÇAIS DE MECANOSYNTHESE

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189 (+1) Groupes de Recherche

(dont 115 (+1)) à l'étranger / 34 Pays)

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Bulletin d'adhésion 2002 / Subcription Print

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

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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.

Journal of Metastable and Nanocrystalline Materials

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The Journal of Metastable and Nanocrystalline Materials is devoted to the rapid diffusion of recent high quality research results concerning nanocrystalline, nanocomposite and metastable materials. All contributions are peer reviewed.

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

Nanomaterials have a high density of interfaces and internal surfaces. Interfaces are also important in the mechanisms of phase transformations in metastable and unstable atomic configurations. The Journal therefore invites studies of nano-interphases and grain boundaries. Improved studies of nanostructures today depend on improved nano-scale characterization methods and nano-probes thus underlining the importance for the Journal, of reporting on their evolution and applications. Finally, properties including magnetic, mechanical, electromagnetic, electrochemical, catalytic and optical will be covered as related to the nanostructure and atomic level chemical and topological order both from applied and fundamental perspective.

Manuscripts

Authors should submit their papers as e-mail attachment to one of the editorial board members. These will prepare, or ask a knowledgeable colleague to prepare, a first review. The manuscript, together with this review, will then be sent to one of the four Editors who will arrange for a second review and advise the authors accordingly, with feed-back to the initial reviewing Board member or Associate Editor.

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Congress and School Announcements

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Matériaux 2002

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21- 25 Octobre 2002
Website : http://www.materiaux2002.net
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Les JRFM'2002 seront intégrées dans le cadre du Congrès
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Poudres et Matériaux Nanostructurés, du fondamental aux applications industrielles
Symposium 1 :
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Fourth INTERNATIONAL CONFERENCE
ON MECHANOCHEMISTRY AND MECHANICAL ALLOYING
4th INCOME 2003

Technical University of Braunschweig, Braunschweig, Germany
September 7-11, 2003
Website : http://www.tu-bs.de/INCOME2003

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

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

FROM marc.descamps@univ-lille1.fr
16/09/2002

Le Laboratoire de Dynamique et Structure Des Materiaux Moleculaires (LDSMM)
UMR CNRS 8024 -Université LILLE1
recherche -de toute urgence (curriculum à envoyer pour le 24 septembre)
• un post doc non français,these realisée en dehors de la france , pour 6mois, position ATER.
salaire: environ 1500 euros par mois.
thématique: mecanosynthèse de materiaux organiques et substances à interet
pharmaceutique

• un chercheur non français senior (curriculum pour le 5 Octobre) sur une position de 3 mois ou de 6 mois
en mecanosynthèse de matériaux organiques et substances pharmaceutiques
CONTACT marc.descamps@univ-lille1.fr
tel:33 (0) 3 20 43 49 79

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From Ch. Gras
(On the 19/08/2002)

POST-DOCTORAL POSITION IN POWDER DIFFRACTION AT IPNS

Argonne National Laboratory, one of the nation's premier scientific research and development organizations, located 20 miles southwest of Chicago, is now looking to fill a post-doctoral position in the Intense Pulsed Neutron Source (IPNS) Division, a facility dedicated to materials science research using neutron scattering techniques.

The successful applicant will join the General Purpose Powder Diffractometer (GPPD) instrument team at IPNS, participate in user-initiated as well as independent scientific programs, and join in commissioning the upgraded GPPD (to be completed in 2003). Ongoing scientific activities include: (1) crystal chemistry and structure-property relationships in catalytic materials; (2) crystallographic and dynamics studies of occluded zeolites - particularly directed at guest-framework interactions; and (3) residual strain/crystallographic texture measurements in alloys and composites, including strain and orientation distribution function determinations. A PhD degree awarded within the last three years in a discipline such as chemistry, materials science or physics is required. Highly desirable is a motivated scientist with a strong background in diffraction and crystallography, including familiarity with x-ray and neutron scattering, powder diffraction and structure/property relationships.

We welcome applications from candidates who can contribute to our EEO/Affirmative Action goals. Interested candidates should submit a curriculum vitae, three letters of recommendation, and a statement of research interests.

Susan M. Walker
Employment and Placement
Box No. IPNS-JWR
Argonne National Laboratory
9700 S. Cass Avenue, Argonne, IL 60439.
Fax: 630-252-9388, Email: employment@anl.gov.

Technical questions concerning this position should be addressed to J. W. Richardson (jwrichardson@anl.gov)

POSTDOCTORAL RESEARCH ASSISTANT IN MODELLING OF PHASE-CHANGE MATERIALS
Research Staff Grade RAIA / Salary: £ 17,626 - £ 26,491 / Job Ref: DJ02/033

Applications are invited for a postdoctoral position, available for up to three years, to model electron transport in phase-change materials. The project is funded by the Hewlett-Packard Laboratory (HPL) in Palo Alto as part of ongoing research into advanced data storage devices. The research will involve the extension of a highly-successful Monte Carlo model for film growth to ternary systems and the development of an in-house Tight-Binding code for electron transport to phase-change materials of interest to HPL. The research programme will be led by Professor David Pettifor FRS.

The successful applicant will be expected to interact closely with experimentalists at HPL, visiting Palo Alto at least every six months. Candidates should have a good first degree and completed a doctorate (by the time of appointment) in physics, materials or a related physical science subject, and should show evidence of the required modelling skills, together with knowledge of their fundamental concepts. Excellent verbal and written communication skills in English (the project language), and the ability to work to agreed time-scales, both independently and in a team, are essential.

Before submitting an application, candidates should obtain further particulars available from The Deputy Administrator (Teaching), Department of Materials, University of Oxford, Parks Road, Oxford OX1 3PH (email: posts@materials.ox.ac.uk), or telephone 01865 273750 quoting reference: DJ02/033. The closing date for applications is 9

August 2002 and interviews are planned for 30 August 2002. Further information on the Department may be found on the web-site: http://www.materials.ox.ac.uk

POSTDOCTORAL RESEARCH ASSISTANT IN MODELLING OF CARBON NANOSTRUCTURES
Research Staff Grade RAIA / Salary: £ 17,626 - £ 26,491 / Job Ref: DJ02/029

Oxford and Cambridge Universities are working together with Hitachi Europe Ltd. to produce radically new devices for future computing, in a project jointly funded by a Foresight LINK Award from the Department of Trade and Industry and Hitachi Europe Ltd. The project brings together research in physics, chemistry, materials science and electronics engineering to make prototype structures for advance conventional computing and for the new field of quantum computing. See www.nanotech.org. Applications are invited for a postdoctoral position in the first-principles modelling of the atomic and electronic properties of endohedral fullerenes within single walled carbon nanotubes. This position is funded until 30 September 2004 and will be supervised by Professor David Pettifor FRS.

The successful applicant will be expected to interact closely with experimentalists performing HREM, STM, EELS and Raman characterization within this LINK programme. Candidates should have a good first degree and completed a doctorate (by the time of appointment) in physics, chemistry or materials, and should show evidence of the required first principles modelling skills. Excellent verbal and written communication skills in English, and the ability to work independently and in a team within an agreed time-scale are essential.

Before submitting an application, candidates should obtain further particulars available from The Deputy Administrator (Teaching), Department of Materials, University of Oxford, Parks Road, Oxford OX1 3PH (email: posts@materials.ox.ac.uk), or telephone 01865 273750 quoting reference: DJ02/029. The closing date for applications is 02 August 2002 and interviews are currently planned for the 29 August 2002. Further information on the Department may be found on the web-site: http://www.materials.ox.ac.uk

POSTDOCTORAL RESEARCH ASSISTANT IN ATOMISTIC MODELLING
RESEARCH STAFF RAIA GRADE / Salary £ 17,626 - £ 26,491 pa / Ref. DJ02/031

Atomistic Modelling: an immediate vacancy exists for a postdoctoral research appointment funded by the EU for the study of nanoscale amorphous layers in structural and functional ceramic materials. The project is part of an international collaboration of nine research institutions in Europe and the US, in which substantial intergroup communication and exchanges are expected, and is funded until January 2005.

This post will involve Grand Canonical Monte Carlo simulations of the equilibrium structure and composition of nanometre scale grain boundary films in silicon oxy-nitride, building on a very successful network model of non-stoichiometric glasses we have recently published in PRL. Ab initio simulations will be used to refine the structures and predict local electronic structures for comparison with experiment. This project will be led by Professors Adrian Sutton and David Pettifor.

The successful applicant will have a good first degree and have completed a doctorate (by the time of appointment) in materials, physics, or a related physical science subject. The post requires the ability to work both independently and collaboratively as part of a team. Candidates should show evidence of the required skills, and a considered interest in the particular field of research.

Before submitting an application, candidates should obtain further particulars from The Deputy Administrator (Teaching), Department of Materials, University of Oxford, Parks Road, Oxford OX1 3PH (email: posts@materials.ox.ac.uk), or telephone 01865 273750 quoting reference: DJ02/031. The closing date for applications is 9 August 2002 and interviews are planned for 29 August 2002. Further information on the Department may be found on the web-site: http://www.materials.ox.ac.uk.

MICROSTRUCTURAL CHARACTERISATION XRD & SEM SPECIALIST
Research Staff grade RAIA / Salary £ 17,626 - £ 22,522 pa / Ref: DJ02/012

Applications are invited from experienced scientists in microstructural characterisation. The Materials Department Services to Industry Characterisation and Analysis Service provides a problem solving and advisory service based on microanalytical techniques to internal research units and external commercial customers. The post holder will provide a high quality, fast turnaround X-ray diffraction (XRD) and scanning electron microscope (SEM) advisory and analytical service. He/she will assist with maintenance and servicing of the Department's analytical facilities, advise on the use of these techniques and in the interpretation of data, and assist in the training of students and other researchers in SEM and XRD techniques. The post is available for three years in the first instance.

Before submitting an application, candidates should obtain further particulars available from The Deputy Administrator (Teaching), Department of Materials, University of Oxford, Parks Road, Oxford OX1 3PH (email: posts@materials.ox.ac.uk), or telephone 01865 273750 quoting reference: DJ02/012. The closing date for applications is 19 July 2002 and interviews are planned for the week beginning 29 July 2002. Further information on the Department may be found on the web-site: http://www.materials.ox.ac.uk

MICROSTRUCTURAL CHARACTERISATION EPMA & SEM SPECIALIST
Research Staff grade RAIA / Salary £ 17,626 - £ 26,491 pa / Ref: DJ02/013

The post of Microstructural Characterisation EPMA & SEM Specialist in the Department of Materials is available for three years in the first instance, to start as soon as possible. Working as part of a small team, the post holder will be involved in providing a high quality, fast turnaround optical microscopy, EPMA & SEM advisory and analytical service to both internal and external customers, assisting with maintenance and servicing of the Department's analytical facilities and advising on the use of these techniques and in the interpretation of data, and participating in the training of students and other researchers in SEM, optical microscopy and EPMA techniques.

Applicants should hold a Materials Science degree and have a detailed understanding of crystallography and a proven, high-level competence in EPMA, with at least five years of sophisticated/advanced analytical expertise. They should be well-organised, have good inter-personal verbal and written communications skills, and an awareness of the financial implications of working with industry, be able to liaise with academic users and industrial customers, and be willing, on occasions, to travel within the UK.

Before submitting an application, candidates should obtain further particulars available from The Deputy Administrator (Teaching), Department of Materials, University of Oxford, Parks Road, Oxford OX1 3PH (email: posts@materials.ox.ac.uk), or telephone 01865 273750, quoting reference: DJ02/013. The closing date for applications is 19 July 2002 and interviews are planned for the week beginning 29 July 2002. Further information on the Department may be found on the web-site: http://www.materials.ox.ac.uk

Périodiques / Congrès

[25] STRUCTURE AND PROPERTIES OF MG-AL-TI-B ALLOYS SYNTHESIZED VIA MECHANICAL ALLOYING

Lu L. Lai MO. Toh YH. Froyen L. - Materials Science & Engineering A-Structural Materials Properties Microstructure & Processing. 334(1-2):163-172, 2002

A quaternary Mg-5 wt.% Al-10.3 wt.% Ti-4.7 wt.% B alloy has been synthesized using mechanical milling, and its structure and properties have been studied. To understand the reaction mechanisms in this quaternary alloy, the individual binary and ternary alloys have been analysed. Extremely large elongation at room temperature of 43% in the binary Mg-10.3 wt.% Ti alloy has been obtained. The quarternary alloy gives the highest yield strength and ultimate tensile strength via the formation of titanium boride particulates. The present investigation demonstrates the potential of the Mg-Al-Ti-B alloy for light weight applications.

[24] HYDROGEN STORAGE PROPERTIES OF NANOCOMPOSITE MG-NI-CU-CRCL3 PREPARED BY MECHANICAL ALLOYING

Yu ZX. Liu ZY. Wang ED. - Materials Science & Engineering A-Structural Materials Properties Microstructure & Processing. 335(1-2):43-48, 2002

The hydrogen storage properties of nanocomposite Mg-2Ni-2Cu-1CrCl(3) (wt.%) prepared by mechanical alloying have been investigated. The ball milling process was performed under hydrogen atmosphere. During the ball milling process, the composite Mg-2Ni-2Cu-1CrCl(3) can absorb hydrogen. When the ball milling time exceeds 110 h, the composite can absorb hydrogen completely (to its maximum). The nanocomposite has remarkable kinetics of hydriding/dehydriding process, for example, the nanocomposite milled for 110 h can absorb 5.5 wt.% hydrogen at 200 degreesC or 6.2 wt.% at 250 degreesC in 60 s under 2.0 MPa hydrogen pressure, and its desorption capacity also exceeds 6.3 wt.% in 700 s at 320 degreesC under 0.1 MPa. The influences of ball milling times on hydrogen storage properties were investigated. The catalytic effect of CrCl3 on the hydriding and dehydriding process was also discussed

[23] PEROVSKITE NANOCRYSTALLITE OF PMN-BASED FERROELECTRICS BY MECHANICAL ACTIVATION

Xue JM. Wang J. Wan DM. Gan BK. - Ferroelectrics. 253(1-4):577-586, 2001.

Nanocrystallites of Pb(Mg1/3Nb2/3)O-3(PMN)-based perovskite structure are formed at room temperature by mechanical activation of the constituent oxides. The activation-triggered occurrence of perovskite nanocrystallites in the oxide compositions proceeds via a process involving nucleation and subsequent growth of perovskite crystallites with increasing degree of mechanical activation. This is fundamentally different from the one or more interfacial reactions and diffusions responsible for a thermally activated solid state reaction occurring at an elevated temperature. Nucleation occurs in a highly activated state, where a degree of amorphization has taken place, and the subsequent growth proceeds as a result of the constant collisions and rearrangement of perovskite nuclei.

[22] MILLING PRECIPITATION METHOD OF POWDER SYNTHESIS FOR FABRICATION OF DENSE SUBMICRON GRAINED PZT AND PZT DERIVED CERAMICS

Golovchanski A. Park TG. Youn CS. Lee SI. Kim MH. Park IY. - Ferroelectrics. 263(1-4):1621-1626, 2001.

High-density fine-grained Pb(Zr0.52Ti0.48)O-3 (PZT) and 0.95 Pb(Zr0.52Ti0.48)O-3-0.05Pb(A(10.5)Nb(0.5))O-3 (PZT-PAN) ceramics have been prepared by using a milling-precipitation technique. Single-phase perovskite structure is achieved at the temperature of 750degreesC for PZT and 800degreesC for PZT-PAN powders. Highly sinterable powders with a particle size of 0.3mum are obtained after re-milling. The resulting PZT-PAN powders sinter to a density of 7.75 g/cm(3) at 900degreesC for 1 hr. Average grain size of the ceramics increases from 0.4mum to 0.9mum depending upon sintering temperature in the range of 900-1100degreesC. The piezoelectric planar coupling coefficient value is 0.57, and the dielectric constant is 1660

ROLE OF THE HEAT OF REACTION IN MODELING MECHANOCHEMICAL PROCESSES

Urakaev FK. Shevchenko VS. Boldyrev VV. - Doklady Physical Chemistry. 377(1-3):59-61, 2001

[21] FABRICATION, STRUCTURE AND CONSOLIDATION OF NIAL-AL2O3 MECHANICALLY ALLOYED NANOCOMPOSITE POWDERS

Oleszak D. Michalski A. Majewski T. - Acta Physica Polonica A. 102(2):187-192, 2002

Reactive milling of NiO + Al powder mixture resulted in the formation of NiAl-Al2O3 nanocomposite powders, with a crystallite size of about 20 nm. The Hall-Williamson analysis revealed that NiAl showed an orientation dependent crystallite size after short processing time and orientation dependent internal strain after long milling time. Both anisotropies were removed by heating the powders in the differential scanning calorimetry. Calorimetric studies showed one exothermic effect attributed to the reduction reaction of NiO and endothermic one associated with melting of Al. Two methods were applied for powders compaction: resistance sintering and pulse electric discharge. In both cases the densities of about 90% of the theoretical value were achieved. A significant increase in average NiAl crystallites size in compacted samples was observed, up to several hundreds of nanometers. [

[20] STRUCTURE AND MAGNETIC PROPERTIES OF NANOCRYSTALLINE FE-MO ALLOYS PREPARED BY MECHANOSYNTHESIS

Karolus M. Jartych E. Oleszak D. - Acta Physica Polonica A. 102(2):253-258, 2002

Nanocrystalline samples of Fe80Mo20 and Fe50Mo50 alloys were prepared by the mechanical milling method. The structure, lattice parameters, and crystallite size were determined by the X-ray diffraction. The magnetic properties of the milled products were determined by the Mossbauer spectroscopy. It was observed that in the case of the Fe80Mo20 alloy a solid solution of Mo in Fe was formed with the lattice parameters of Fe increasing from 0.28659 nm to 0.29240 nm and the

crystallite size decreasing from 250 nm to 20 nm. In the case of the Fe50Mo50 alloy there were no clear changes in values of the lattice parameters of Fe and Mo during. the milling process, but the crystallite size decreased from 200 nm to 15 nm. Mossbauer spectra revealed different magnetic phases in the mechanosynthesized Fe-Mo samples. In the case of the Fe80Mo20 alloy, the spectrum for the milled mixture indicated the formation of a solid solution. In contrast, for the Fe50Mo50 the spectrum indicated the disappearance of the ferromagnetic phase

[19] MECHANOCHEMICAL SYNTHESIS OF ALKALI METAL HYDROXIDE-SALT ADDUCTS

Nikitina ZK. Nikitina NI. Borisov AP. - Russian Journal of Inorganic Chemistry. 47(7):937-939, 2002

Three examples of mechanochemical solid-state reactions in salt-hydroxide systems were studied. Double compounds 7KO(2) (.) 5KOH and NaO2 (.) 2NaOH were prepared as a result of the mechanical activation of the starting reactants in a vibrational mill. The reaction NalO(4) + 4NaOH --> Na5IO6 + 2H(2)O occurs smoothly and quantitatively as a result of the mechanical activation of the feedstock followed by heating to 100-150degreesC

[18] OPTICAL PROPERTIES OF HYDROXYAPATITE OBTAINED BY MECHANICAL ALLOYING

Silva CC. Thomazini D. Pinheiro AG. Lanciotti F. Sasaki JM. Goes JC. Sombra ASB. - Journal of Physics & Chemistry of Solids. 63(9):1745-1757, 2002

Calcium phosphate based bioceramics, mainly in the form of hydroxyapatite (HA), have been in use in medicine and dentistry for the last 20 years. Applications include coatings of orthopaedic and dental implants, alveolar ridge augmentation, maxillofacial surgery, otolaryngology, and scaffolds for bone growth and as powders in total hip and knee surgery. These materials exhibit several problems of handling and fabrication, which can be overcome by mixing with a suitable binder. In this paper, mechanical alloying has been used successfully to produce nanocrystalline powders of HA using five different experimental procedures. The milled HA were studied by X-ray powder diffraction, infrared and Raman scattering spectroscopy. For four different procedures, HA was obtained after a couple of hours of milling (on an average, 20 h of milling depending on the reaction procedure). The XRD patterns indicate that the grain size is within the range of 29-103 nm. This milling process, used to produce HA, presents the advantage that melting is not necessary and the powder obtained is nanocrystalline with extraordinary mechanical properties. The material can be compacted and transformed in solid ceramic samples. The high efficiency of the process opens a way to produce commercial amount of nanocrystalline HA. Due to the nanocrystalline character of this powder, their mechanical properties have changed and for this reason a pressure of 1 GPa is enough to shape the sample into any geometry.

[17] X-RAY PHOTOELECTRON SPECTROSCOPIC STUDIES ON NANOQUASICRYSTALLINE POWDERS OF AL70CU20FE10 OBTAINED BY MECHANICAL ALLOYING

Barua P. Srinivas V. Dhabal S. Ghosh TB. - Journal of Materials Research. 17(8):1892-1895, 2002

Surface chemical properties of nanoguasicrystalline powders of Al-Cu-Fe synthesized by the ball-milling technique have been investigated using x-ray photoelectron spectroscopy (XPS). The samples were exposed to ambient conditions at room temperature as well as higher temperatures. Our XPS results reveal that the surfaces of nanopowders of Al70Cu20Fe10 are coated with an Al2O3 layer within which the quasicrystalline phase resides. It also appears that the thickness of this layer does not increase significantly on either heating below 873 K or prolonged exposure to ambient conditions.

[16] LARGE-QUANTITY PRODUCTION OF HIGH-YIELD BORON NITRIDE NANOTUBES

Chen Y. Conway M. Williams JS. Zou J. - Journal of Materials Research. 17(8):1896-1899, 2002

A high quantity and Yield (up to 85%) of boron nitride (BN) nanotubes have been produced using a mechanothermal method. Elemental boron powders were first mechanically milled at room temperature in NH3 atmosphere and subsequently heated in N-2 gas at 1200 degreesC for up to 16 h. The BN nanotubes obtained have either multiwalled cylindrical or bamboolike structures, suggesting different growth processes. The high formation yield of BN nanotubes is due to a high density of nanostructured nuclei created by an extensive milling treatment.

[15] COMBUSTION SYNTHESIS OF MECHANICALLY ACTIVATED POWDERS IN THE NB-SI SYSTEM

Maglia F. Milanese C. Anselmi-Tamburini U. Doppiu S. Cocco G. - Journal of Materials Research. 17(8):1992-1999, 2002

The effect of the mechanical activation of the reactants on the self-propagating high-temperature synthesis (SHS) of niobium silicides was investigated. SHS experiments were performed on reactant powder blends of composition Nb:Si = 1:2 and Nb:Si = 5:3 pretreated for selected milling times. A self-sustaining reaction could be initiated when a sufficiently long milling time was employed. At short milling times, the reactions self-extinguished or propagated in an unsteady mode. Combustion peak temperature, wave velocity, and product composition were markedly influenced by the length of the milling treatment. Single-phase products could be obtained for sufficiently long milling times. Observation of microstructural evolution in quenched reactions together with isothermal experiments allowed clarification of the mechanism of the combustion process and the role played by the mechanical activation of the reactants

[14] INVESTIGATION OF MECHANICAL ALLOYING OF TI-AL COMPOUNDS USING PERTURBED GAMMA GAMMA-ANGULAR CORRELATION SPECTROSCOPY, X-RAY DIFFRACTION, AND DIFFERENTIAL SCANNING CALORIMETRY

S. Guan Z. Wolf H. Wichert T. - Journal of Materials Research. 17(8):2130-2139, 2002

Ti0.50Al0.50 and Ti0.75Al0.25 compounds were mechanically alloyed by ball milling of elemental Ti and Al powders. Radioactive In-111 atoms incorporated into these compounds were used to investigate the different locally ordered crystalline structures by perturbed gammagamma-angular correlation spectroscopy (PAC). The formation of the intermetallic compounds gamma-TiAl and alpha(2)-Ti3Al was observed on an atomic scale and occur-red as a consequence of the heat treatment of mechanically alloyed Ti0.50Al0.50 and Ti0.75Al0.25, respectively. Due to the sensitivity of PAC to local order on an atomic scale, information about formation conditions and thermal stability of a new metastable phase with an ordered tetragonal crystal structure is presented for Ti0.50Al0.50 samples. In addition, the formation of the ordered phase Ti2AlN was observed, indicating the incorporation of N during the milling process. The PAC investigations were complemented by x-ray diffraction and differential scanning calorimetry measurements.

[13] HIGH-PRESSURE, HIGH-TEMPERATURE SINTERING OF DIAMOND-SIC COMPOSITES BY BALL-MILLED DIAMOND-SI MIXTURES

Qian J. Voronin G. Zerda TW. He D. Zhao Y. - Journal of Materials Research. 17(8):2153-2160, 2002

A new method of sintering diamond-silicon carbide composites is proposed. This method is an alternate to the liquid silicon infiltration technique and is based on simultaneous ball milling of diamond and silicon powder mixtures. Composites with fine-grain diamonds embedded in a diamond-SiC nanocrystalline matrix were sintered from these mixtures. Scanning electron microscopy, x-ray diffraction, and Raman scattering were used to characterize the ball-milled precursors and the sintered composites. It was found that the presence of diamond micron-size particles in the initial powder mixture promotes milling of silicone particles and their transformation into the amorphous state. Mechanical properties of the composites, sintered from mixtures of different ball-milling history at different pressure-temperature conditions, (6 GPa/1400 degreesC and 8 GPa/2000 degreesC) were studied.

[12] PHASE TRANSFORMATIONS AND THERMAL EFFECTS OF MECHANICALLY ACTIVATED BACO3-TIO2 SYSTEM

Pavlovic VB. Marinkovic ZV. Pavlovic VP. Nikolic Z. Stojanovic B. Ristic MM. - Ferroelectrics. 271:1981-1986, 2002.

Phase transformations and thermal effects of BaTiO3 ceramics due to influence of mechanical activation were investigated. Equimolar mixture of BaCO3 and TiO2 powders was activated in high energy vibromill for various grinding times. Specific surface area determinations of initial and activated powders were carried out. The phase composition and crystallographic data of initial and thermal treated powders was determined using X-ray powder diffraction method. Heating process was investigated using differential thermal analysis.

[11] PHASE TRANSFORMATIONS IN SILICON UNDER DRY AND LUBRICATED SLIDING

Kovalchenko A. Gogotsi Y. Domnich V. Erdemir A. - Tribology Transactions. 45(3):372-380, 2002

Sliding friction and wear mechanisms of silicon/silicon nitride test pairs were investigated under conditions of both dry and lubricated sliding. High-resolution surface topography mapping and electron microscopy studies revealed that microfracture was the predominant wear mechanism under dry, and grease-lubricated sliding conditions. Raman spectroscopy suggested that in certain areas of the sliding contact, silicon underwent phase transformation and reached a metallic state because of high contact pressures. The extent of phase transformation was greater during the very early stages of the run-in period than during stead-NI-state sliding regimes. The use of grease and oil as lubricants led to a substantial reduction in friction and greatly diminished wear due to microfracture. Furthermore, almost all areas on Si surfaces subjected to lubricated sliding contact underwent pressure-induced phase transformation. Both amorphous Material and crystalline Si phases were identified by Raman spectroscopy. The experimental observations suggested that the wear process in lubricated sliding contacts was mainly dominated by the formation of a ductile metallic Si phase and subsequent removal of the transformed layers. The results of this study demonstrate that pressure-induced phase transformation must be taken into account when considering possible wear mechanisms of silicon in contact with other hard materials, inasmuch as it contributes notably to the wear of silicon under lubricated sliding.

[10] PRESSURE-INDUCED AMORPHIZATION OF BISMUTH ORTHOSILICATE

Ravindran TR. Arora AK. Gopalakrishnan R. - Journal of Physics-Condensed Matter. 14(25):6579-6589, 2002

High-pressure behaviour of bismuth orthosilicate (Bi4Si3O12) is investigated in a diamond anvil cell up to a pressure of 20 GPa using Raman spectroscopy. A new broad peak observed in the Raman spectra above 6 GPa is assigned to resonantly excited photoluminescence from self-trapped Frenkel excitons. Two phonons are found to have negative Gruneisen parameter, suggesting instability of the structure at high pressure. Broadening and disappearance of most of the Raman lines suggest amorphization of this system above 16 GPa. Amorphization is found to be reversible, unlike the case of Bi4Ge3O12, where it is irreversible. In light of a recent model of pressure-induced amorphization it is argued that amorphization in bismuth orthosilicates and germanates arises due to kinetic hindrance of decomposition into mixtures of daughter compounds with dense-packed structures

[9] SYNTHESIS AND PROCESSING OF NANOSTRUCTURED WC-CO MATERIALS

Ban ZG. Shaw LL. - Journal of Materials Science. 37(16):3397-3403, 2002

In this study a novel approach, termed the integrated mechanical and thermal activation (IMTA) process, was used to synthesize nanostructured WC-Co powder. As a result of the integration of mechanical and thermal activation, nanostructured WC-Co powder was synthesized below 1000degreesC, starting from WO3, CoO and graphite powder mixtures. Furthermore, consolidation of the nanostructured WC-Co powder via high velocity oxy-fuel (HVOF) thermal spraying and solid state sintering was investigated. The results demonstrated the feasibility of converting the nanostructured

WC-Co powder to coatings and bulk components, the properties of which are either comparable to or better than that of the conventional coarse-grained counterparts

[8] INFLUENCE OF ALUMINA DOPANT ON THE PROPERTIES OF YTTRIA-STABILIZED ZIRCONIA FOR SOFC APPLICATIONS

Hassan AAE. Menzler NH. Blass G. Ali ME. Buchkremer HP. Stover D. - Journal of Materials Science. 37(16):3467-3475, 2002

The most important component of the solid oxide fuel cell (SOFC) is the dense electrolyte. Besides gastightness it must fulfill the requirements of good ionic conductivity and stability in reducing and oxidizing atmospheres. For this application yttria-stabilized zirconia is widely used. In this paper the effect of calcination temperature and milling time for zirconia powder stabilized with 8 mol% yttria (8YSZ) on the gastightness of the electrolyte layer was investigated. The influence of the addition of 0.77, 2 and 4 wt% Al2O3 to 8YSZ powder on the tightness and the sinterability of the electrolyte layer was studied. The performance of the cell with the electrolyte doped with 0.77 wt% Al2O3 was also investigated. The experiments show that the electrolyte layer, which was fabricated from 8YSZ powder (calcined at 1200degreesC) with particle size distributions of 0.25 mum-<0.3 mum (d(50)), gives the lowest leak rate. The Al2O3 added to 8YSZ improved the electrolyte tightness by increasing the sinterability of the electrolyte layer and reducing the sintering time. The performance of a cell with Al2O3 added to the electrolyte is better than that of a cell with an electrolyte of pure 8YSZ, especially at operating temperatures between 800 and 900degreesC.

[7] EFFECT OF HEATING CONDITIONS DURING COMBUSTION SYNTHESIS ON THE CHARACTERISTICS OF NI0.5ZN0.5FE2O4 NANOPOWDERS

Costa ACFM. Tortella E. Morelli MR. Kaufman M. Kiminami RHGA. - Journal of Materials Science. 37(17):3569-3572, 2002

Ni-Zn ferrite powders were synthesized by combustion reaction. The effect of external conditions of heating on the characteristics of the resulting powders was evaluated. Two synthesis routes were studied. The first involved preheating on a hot plate at 300degreesC and subsequently heating in a muffle furnace at 700degreesC (RCPM). In the second route the powders (RCP) were heated directly to 600degreesC on a hot plate until self-ignition occurred. The resulting RCP products were evaluated before and after attritor milling in order to reduce the size and increase the uniformity of particles and/or agglomerates. The resulting powders were characterized by X-ray diffraction (XRD), BET, scanning electron microscopy (SEM), helium pycnometry, sedimentation and transmission electron microscopy (TEM). The results showed that it was possible to obtain Ni-Zn ferrite powders using both routes and that the second route (RCP) was the most favorable in terms of obtaining powders with high surface area. The efficiency of the grinding was confirmed by the reduction of the size of the particles.

[6] AN ANALYSIS OF STRENGTHENING MECHANISMS IN A MECHANICALLY ALLOYED, OXIDE DISPERSION STRENGTHENED IRON ALUMINIDE INTERMETALLIC

Munoz-Morris MA. Oca CG. Morris DG. - Acta Materialia. 50(11):2825-2836, 2002

An iron aluminide alloy of base composition Fe-40Al has been prepared by mechanical alloying and processed using a variety of powder consolidation methods and heat treatments to produce a range of grain sizes and oxide dispersoid sizes. The strengths of these materials have been determined at room temperature and related to the various aspects of microstructure. Fine dispersoid particles may pin grain boundaries and help determine the fine grain size and contribute very significantly to the material strength. Grain size strengthening is shown to be a rather small component of the material strength, with the matrix strength being rather high for this intermetallic. The influence of other factors such as texture and the direction of application of stress (tension or compression) are also briefly discussed.

[5] REDUCTION BEHAVIOR HAVING ULTRA-HIGH RATE ON THE HEMATITE-GRAPHITE MIXTURE AFTER BALL MILLING

Y Kashiwaya, JV Khaki, K Ishii - 61ST IRONMAKING CONFERENCE PROCEEDINGS (Series: IRONMAKING CONFERENCE PROCEEDINGS), 2002, Vol 61, pp 523-531 - 61ST IRONMAKING CONFERENCE; NASHVILLE, TENNESSEE. MARCH 10-13, 2002

[4] ALUMINUM BASED MATERIALS CONTAINING LOW MELTING AND HIGH MELTING METALS PRODUCED BY MECHANICAL ALLOYING WITH ADDITION OF METAL OXIDES

J Kaneko, M Sugamata, L Blaz, R Kamei - ALUMINUM ALLOYS 2002: THEIR PHYSICAL AND MECHANICAL PROPERTIES PTS 1 - 3 (Series: MATERIALS SCIENCE FORUM), 2002, Vol 396-4, pp 161-166 - 8TH INTERNATIONAL CONFERENCE ON ALUMINIUM ALLOYS; CAMBRIDGE, ENGLAND. JULY 2-5, 2002

Aluminum based materials containing both low melting and high melting metals were produced by mechanical alloying with addition of their oxides. As the oxides of low melting metals PbO and SnO2 were chosen, and WO3 and MoO3 as of high melting metals. Four materials were prepared as the test materials; Al-PbO-WO3, Al-PbO-MoO3, Al-SnO2-WO3 and Al-SnO2-MoO3. Mechanically alloyed powders were vacuum hot pressed and hot extruded. Microstructural evolutions and changes in constituent phases were studied by TEM, OM and XRD for the materials at various thermal stages. Diffraction lines from metallic Pb and Sri became detectable in the XRD patterns of the hot pressed materials, indicating decomposition of the oxides of low melting metals. Formation of the aluminide compounds of high melting metals was observed after heating of the consolidated materials at 873K forth. Thus, aluminum alloys of uniformly tine microstuructures containing both low melting metal and high melting metal were obtained. Because of the high hardness with high thermal stability and

extremely fine dispersed particles of low melting metals, the consolidated materials are considered to exhibit high tribological performance.

[3] MMC PRODUCTION METHOD USING DYNAMIC CONSOLIDATION OF MECHANICALLY ALLOYED ALUMINUM AND SILICON CARBIDE POWDERS

VA Popov, AA Aksenov, VV Ivanov, DR Lesuer, VN Gulbin, AG Kobelev, AN Solonin, SN Paranin, II Khodos, OM Smirnov, SV Zayats - ALUMINUM ALLOYS 2002: THEIR PHYSICAL AND MECHANICAL PROPERTIES PTS 1 - 3 (Series: MATERIALS SCIENCE FORUM), 2002, Vol 396-4, pp 289-294 - 8thINTERNATIONAL CONFERENCE ON ALUMINIUM ALLOYS; CAMBRIDGE, ENGLAND. JULY 2-5, 2002

The paper deals with investigation of the process of manufacturing MMC by dynamic consolidation of mechanically alloyed particulate aluminum and silicon carbide. Mechanical alloying was carrying out in high-energy planetary mills. Dynamic consolidation was made by two methods i.e. Magnetic-pulse pressurizing and explosion treating. Structure has been investigated by optical, scanning and transmission electron microscopy. The investigations have been shown that dynamic consolidation of initially mechanically alloyed particulate aluminum and silicon carbide enables to obtain high-quality material without pores, cavities and other defects.

[2] BULK NANOSTRUCTURED MATERIALS PRODUCED BY SEVERE PLASTIC DEFORMATION UNDER HIGH PRESSURE

RZ Valiev, IV Alexandrov - HIGH PRESSURE EFFECTS IN CHEMISTRY, BIOLOGY AND MATERIALS SCIENCE (Series: DEFECT AND DIFFUSION FORUM), 2002, Vol 208-2, pp 141-149 - 4TH HIGH PRESSURE SCHOOL ON CHEMISTRY, BIOLOGY, MATERIALS SCIENCE AND TECHNIQUES; WARSAW, POLAND. JUNE 22-25, 2001

Severe plastic deformation (SPD), i.e. Intense plastic straining under high pressure is an innovative technique for processing ultrafine-grained nanostructured metals and alloys. Materials with nanostructures fabricated by means of SPD may display novel properties, which, however, depend strongly on the processing parameters. This paper focuses on examples of attaining enhanced mechanical properties in several metals and alloys subjected to severe plastic deformation. In addition, the relationships between processing conditions, micro structures and properties of materials produced by the SPD are considered.

[1] NANOSTRUCTURE FORMATION IN COPPER SUBJECTED TO HIGH PRESSURE TORSION

IV Alexandrov, AA Dubravina, HS Kim - HIGH PRESSURE EFFECTS IN CHEMISTRY, BIOLOGY AND MATERIALS SCIENCE (Series: DEFECT AND DIFFUSION FORUM), 2002, Vol 208-2, pp 229-232 - 4TH HIGH PRESSURE SCHOOL ON CHEMISTRY, BIOLOGY, MATERIALS SCIENCE AND TECHNIQUES; WARSAW, POLAND. JUNE 22-25, 2001

The obtained results of the microstructure evolution in pure Cu during the severe plastic deformation process indicate a non-monotonous character of the evolution of the structure. The formation of cellular type microstructure with a very high density of the lattice dislocations and the considerable hardening of the material are characteristic features of the first stage of SPD. In the second stage dynamic recovery processes resulted in the transition to the subgrain structure followed by the decrease of the microhardness. The third stage is characterized by the fort-nation of equiaxed nanostructure with high-angle grain boundaries and consider-able crystal lattice elastic microdistortions, which improve the strength characteristics of pure Cu.

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