

Table of Contents

Preface

Mechanical Alloying and Chaos

A. Otsuki, P.H. Shingu and K.N. Ishihara 5

Dislocations, Defects and Disorder during Mechanical Milling

D.G. Morris and A. Benghalem 11

The Influence of Dislocation Structure on Formation of Nanocrystals by Mechanical Attrition

T.D. Shen and C.C. Koch 17

Relaxation of Atomic Structure on Mechanical Treatment of Solids

P.Y. Butyagin 25

X-Ray Analysis of the Metals Fine Structure and Amorphisation Reaction in Mechanical Alloying

Y.A. Skakov, N.V. Edneral, E.V. Frolova and J.A. Povolozi 33

Dilatometric Characterization of Micrograined Metallic Powders

S. Gialanella, R. Di Lorenzo and F. Marino 39

Prediction of Phase Transformations in Intermetallic Compounds Induced by Milling

H. Bakker, G.F. Zhou and H. Yang 47

The Charm of Disorder

R.W. Cahn 53

Defect Structures in Ball-Milled Intermetallic Powders

S. Gialanella and L. Lutterotti 59

Ion Induced Amorphization in Metallic Compounds

P.M. Ossi 65

A Possible Mechanism of Disorder of Ordered Alloys by Irradiation and Ball Milling

H. Yang, L. Huang and H. Bakker 73

Structures and Magnetic Properties of Some Novel Materials Obtained by Milling of Intermetallics

G.F. Zhou and H. Bakker 79

Phase Formation during Ball Milling of Intermetallic Compounds with Different Structures

U. Herr and K. Samwer 85

Kinetics of the Ball-Milling Induced Order-Disorder Transformation in Fe-Al

P. Pochet, L. Chaffron and G. Martin 91

EXAFS Study of the Mechanical Alloying of Pd-Si Powder Mixtures

T. Nasu, K. Nagaoka, M. Sakurai and K. Suzuki 97

Mechanical Grinding of Iron Borides

C.E. Rodríguez Torres, F.H. Sánchez, L. Mendoza-Zélis and M.B. Fernández Van Raap 103

Mössbauer Effect Study of Disorder Induced by Mechanical Alloying in the Fe-Si System

M. Abdellaoui, E. Gaffet and C. Djega-Mariadassou 109

Surface Area and Particle Size of Mechanically Milled Fe₃Ge₂

W.E. Brower, K.A. Prudlow and T.R. Reitenbach 115

Phase Transformation Induced by Ball Milling in Fe-Zr System and Related Magnetic Properties

S.E. Lee, H.Y. Ra, T.H. Yim and W.T. Kim 121

Structural Transformations in Al₈₅Y₁₀Ni₅ Alloy Induced by Mechanical Alloying

M. Burzyńska-Szysko, V.I. Fadeeva and H. Matyja 127

Phase Transformations and Nanostructure Formation of ZrO₂-Y₂O₃ and ZrO₂-CeO₂ Powder Mixtures during High Energy Ball Milling

Y.L. Chen, M. Zhu, M. Qi, D.Z. Yang and H.J. Fecht 133

Synthesis, Thermal Properties and Recrystallization of Ball-Milled High T_c Superconductors. (Topological Stabilization of Metastable Phases)

R. Schulz, J. Lanteigne, M. Simoneau, P. Tessier, A. Van Neste and J.O. Ström-Olsen 141

Extended Concept of Mechanical Alloying for Complex and Composite Inorganic Materials

M. Senna 147

Characteristics of Ma Metastable Ti+Al Powders at High Temperatures J.H. Ahn, K.R. Lee and H.K. Cho	153
Nanophase Formation Activated by Mechanical Alloying E. Gaffet and N. Malhouroux-Gaffet	159
Mechanical Alloying of Thermoelectric FeSi₂ Compound M. Umemoto, S. Shiga, K. Raviprasad and I. Okane	165
Preparation of Nanocrystalline Nb₃Al Powders by Mechanical Grinding and Alloying J. Saida, K. Ohsaki, Y. Tanaka, M. Uda and K. Okazaki	171
Mechano-Synthesis of Iron Containing Aluminium Alloys M. Meyer, L. Mendoza-Zélis and F.H. Sánchez	177
Mechanosynthesis of Tungsten Carbide G.M. Wang, P. Millet, A. Calka and S.J. Campbell	183
Synthesis of TiAl-Al₂Ti₄C₂ Composite by Reaction Milling T. Suzuki and M. Nagumo	189
Formation of Iron Nitride-Carbide Composite by Solid State Reactions between Iron and Organic H_x(CN)-Ring Compounds W.A. Kaczmarek and I. Onyszkiewicz	195
Carburization of Iron by Ball-Milling Fe₅₀-C₅₀ G.M. Wang, A. Calka, S.J. Campbell and W.A. Kaczmarek	201
Novel Synthesis of Lead Titanate by Mechanical Alloying A.O. Aning, C. Hong and S.B. Desu	207
Mechanical Alloying in the Fe-Based Systems D. Oleszak, M. Jachimowicz and H. Matyja	215
Hyperfine Interactions and Microstructure of Some Iron Nitrides Obtained by Mechanosynthesis R.S. de Figueiredo and J. Foct	219
FeCu Solid Solutions P. Crespo, A. Hernando and A. Garcia Escorial	225
Mechanical Alloying of Iron and Tin Powders: A Mössbauer Study A.F. Cabrera, F.H. Sánchez and L. Mendoza-Zélis	231
Metastable Phase Formation and Activity Estimation of the Ag-Cu System Prepared by Mechanical Alloying S.D. De la Torre, A. Yamamoto, K.N. Ishihara, P.H. Shingu, T. Hirato and Y. Awakura	237
Formation of Co-Cu Supersaturated Solid Solutions by Mechanical Alloying J.G. Cabañas-Moreno, H. Dorantes, V.M. López-Hirata, H.A. Calderón and J.M. Hallen-López	243
A Study of the Consumption of Iron during the Mechanical Alloying of the Cu-Fe Immiscible System P.P. Macrí, P. Rose, D.E. Banda, N. Cowlam, G. Principi and S. Enzo	249
On the Evolution of the Amorphous Phase in Cu-Ti Alloys Produced by Mechanical Alloying J.A. Hunt, I. Soletta, S. Enzo, L. Meiya, R.L. Havill, L. Battezzati, G. Cocco and N. Cowlam	255
Formation of Co-Sn Alloys by Mechanical Alloying V.M. López-Hirata, U. Juárez-Martínez and J.G. Cabañas-Moreno	261
Structure and Thermal Stability of CuCo and CuFe Alloys Prepared by Mechanical Alloying R. Elkalkouli, P. Chartier and J.F. Dinhut	267
Amorphization of Mechanically Alloyed Fe-C and Fe-N Materials with Additive Elements and their Concentration Dependence K. Omuro and H. Miura	273
Gas-Solid Interaction in Milling Processes: Mechanochemical Hydrogenation Reactions via Metal Hydrides G. Cocco, G. Mulas and L. Schiffini	281
Metal-Nitride Composites Obtained by Alloy Milling under Nitrogen Gas J. Secondi, O. Drbohlav and R. Yavari	287
Structure and Thermal Properties of Tungsten and Molybdenum Milled in Nitriding Environment: Effect of Milling Time and Atmosphere A. Calka, J.I. Nikolov, Z.L. Li and J.R. Williams	295

Mechanistic Study of the Nitriding Reaction Induced by Mechanical Alloying Y. Chen and J.S. Williams	301
Preparation of (Al,Ti) by Mechanical Alloying of Al-Ti Powder Mixtures under Nitrogen Atmosphere M. Miki, T. Yamasaki and Y. Ogino	307
Effects of Gas Surface Layer during Mechanical Processing of Complex Magnetic Oxide on Structure, Morphology, Thermal and magnetic Properties W.A. Kaczmarek	313
Ball Milling of Soft Metals: The Formation of Gallium Nitride P. Millet and A. Calka	321
Effect of Oxygen Impurities in Mechanical Alloying of Pd-Si M. Magini, C. Colella, W.H. Guo, T. Dikonimos Makris and S. Turtù	325
The Dynamics of Magneto-Ball Milling and Its Effect on Phase Transformations during Mechanical Alloying A. Calka and J.I. Nikolov	333
Physics of Mechanical Alloying in Planetary Ball Mill and the Horizontal Rod Mill: Kinematic Approach M. Abdellaoui and E. Gaffet	339
The Influence of High-Energy Ball-Milling Conditions on the Kinetics of Communion and Crystallization of Amorphous Alloys Based on Fe and Ni T.Y. Mochalova, S.D. Kaloshkin and I.A. Tomilin	345
Bulk Synthesis of Nanometer-Sized Materials by Combination of Mechanical Alloying and Compaction R. Rahouadj, O. El Kedim, P. Lesage, M. Abdellaoui and E. Gaffet	351
Bulk Synthesis of Novel Nanocrystalline and Amorphous Tungsten-Base Materials N.C. Angastiniotis and B.H. Kear	357
Characterization of Mechanically Processed, Compacted and Heat Treated Nitrogenated bcc-Iron Powder J. Rawers, R.D. Govier and G. Korth	363
A Fine Grain Sized Al-65 AT.% Ni Alloy Prepared by Mechanical Milling J. Wolska and J. Mehnen	369
Nanostructure Refinement in Mechanically Alloyed Copper Powders by Co-Milling with TiN Particles S.C. Axtell, B.W. Robertson and M.R. Malik	375
Optical Artificial Lattice Produced by Mechanical Alloying P.H. Shingu, K.N. Ishihara and A. Otsuki	383
Reactions of Titanium and Niobium Deuterides under Intensive Mechanical Treatment J. Uchirin, R. Uchirin, K.B. Gerasimov and O. Lomovski	389
Modification Induced by Milling on Liquid Phase Sintering C. Chausse, F. Nardou and E. Gaffet	391
Metastable Phases in Mechanically Alloyed Al-Fe System V.I. Fadeeva, A.V. Leonov and L.N. Khodina	397
Synthesis of TaSi₂, MoSi₂ in Mechanochemical Reactors Made from Relating Metals E.Y. Belyaev, O.I. Lomovsky and G. Golubkova	403
Zirconium Extraction from ZrSiO₄ after Mechanical Activation T. Puclin and J. Kaczmarek	407
Contamination Control in the Mechanical Alloying of Nanocrystalline Intermetallic Compound Based Alloys P.S. Goodwin and C.M. Ward-Close	411
Attritor Technology-Latest Developments H. Zoz	419
Possible Use of Planetary Mills in Investigations of Mechanically Alloyed Materials in the Field of Mechanochemistry J. Uchirin, R. Uchirin and E.G. Avvakumov	425
Preparation and Mechanical Properties of TiAl Alloys with Submicron Grain Size M. Oehring, F. Appel, T. Pfullmann and R. Bormann	435
Thermodynamic Stabilization of Grain Boundaries in Nanocrystalline Alloys C.E. Krill III, R. Klein, S. Janes and R. Birringer	443

Electrochemical Properties of Nanocrystalline Ni-Mo Alloys Produced by Crystallization H. Alves, M. Ferreira and U. Köster	449
Mechanically Decomposed Composites A.Y. Yermakov	455
Thermal Evolution of Nanocrystalline Intermetallic Materials by DSC Measurements S. Suriñach, J. Malagelada and M.D. Baró	463
The Study of Fe-Based Mechanically Alloyed Materials by Mössbauer Spectroscopy G. Le Caër, P. Delcroix, M.O. Kientz and B. Malaman	469
Decomposition of CuFe-Type Nanocrystalline Supersaturated Solid Solutions O. Drbohlav, J. Secondi and A.R. Yavari	475
TEM Observation of the Reordering Mechanism in a Partially Disordered Ni₃Al-Based Alloy S. Lay and A.R. Yavari	483
Grain Refinement and Nanocrystallization of Ni₃Si by Ag-Addition and Rapid Solidification E. Munsterhjelm, O. Drbohlav, R. Durand and R. Yavari	489
Soft-Magnetic Properties of Cu-Free, Fe-Based Nanocrystalline Alloys A. Inoue, A. Makino and T. Masumoto	497
Nanocrystallization and Magnetic Properties A. Hernando and T. Kulik	507
Metastable Iron Nitrides J.M.D. Coey and K. O'Donnell	513
The Magnetic Properties of FeSiBCuNb Wires during the First Stages to the Nanocrystallization Process M. Vázquez, P. Marín, A.O. Olofinjana and H.A. Davies	521
Formation and Hard Magnetic Properties of Sm-Co-Fe Materials Prepared via Mechanical Alloying P.A.I. Smith, P.G. McCormick and R. Street	527
Formation of Nanocrystalline Materials by Crystallization of Metallic Glasses U. Köster, J. Meinhardt and H. Alves	533
Influence of Additions on Crystallization and Magnetic Properties of Amorphous Fe_{77.5}Si_{15.5}B₇ N. Mattern, A. Danzig and M. Müller	539
Nanocrystallized Fe-Based Metglasses Investigated by Mössbauer Spectrometry N. Randrianantoandro, J.M. Grenèche, E. Jedryka, A. Ślawska-Waniewska and H.K. Lachowicz	545
Structure and Magnetic Properties of Melt Spun FeNdB Alloys Nanocrystallized by Thermal Treatment N. Clavaguera, J.M. Machado da Silva, J.B. Oliveira, J.A. Diego and M.T. Clavaguera-Mora	551
The Influence of Amorphous Alloys Composition on Kinetics of Crystallization with the Nanocrystalline Structure Formation S.D. Kaloshkin, I.A. Tomilin, B.V. Jalnin, I.B. Kekalo and E.V. Shelekhov	557
Magnetic Properties and Microstructure of Nanocrystalline FeZrB(Cu) Alloys A. Ślawska-Waniewska and P. Nowicki	563
On the Role of Cu in the Nanocrystallization of Fe-Zr-Based Meltspun Amorphous Alloys O. Drbohlav, B. Bochu, A.R. Yavari, S. Suriñach and M.D. Baró	569
On the Use of Joule Heating Techniques to Produce Nanostructured Magnetic Materials from Melt-Spun Ribbons P. Allia, M. Baricco, C. Beatrice, M. Knobel, P. Tiberto and F. Vinai	575
Amorphous to Nanocrystalline Transformation of a Finemet-Type Alloy C.F. Conde and A. Conde	581
Nanocrystallization and Structure of Fe_{73.5}Cu₁Nb₃Si_{22.5-x}B_x Alloys T. Kulik and A. Hernando	587
Low Frequency Soft Magnetic Properties of Fe-Zr-B-Cu Nanocrystalline Alloys F. Kogiku, N. Shiga and M. Yukumoto	593
Nanocrystals through Crystallization of Amorphous Alloys M. Baricco and L. Battezzati	597
Structure, Property, Processing Relationships in Nanocrystalline Sputtered Magnetic Films B.W. Robertson, Y. Liu, Z.S. Shan, S.H. Liou and D.J. Sellmyer	603

Electron Transport in Nanocrystalline Alloys K. Pekała, P. Jaśkiewicz, M. Pekała and T. Kulik	609
Magnetic Properties of Some Amorphous Alloys Annealed by Dynamic Joule Heating: Influence of Temperature and Applied Stress A. Houzali, F. Alves and J.C. Perron	615
Nanocrystalline Al-Composites by Mechanical Milling M.A. Morris, T. Lipe and S. Gunter	623
Mechanically Alloyed Antiferromagnetic-Ferromagnetic Exchange Coupled Nano-Composites D.S. Geoghegan, P.G. McCormick and R. Street	629
Ceramic-Metal Composites Obtained by Reactive Milling W.J. Botta Filho, D.E. Hanai, B.N. Santana, N.R.d. Oliveira Jr. and R. Tomasi	635
Nanosized Cadmium Crystallites in Aluminium L. Sarholt-Kristensen, A. Johansen, E. Johnson, K.K. Bourdelle, M. Olsen and H.H. Andersen	641
Grain Size Dependence of Hardness of Metal-TiN Nanocomposite Materials Prepared by Mechanical Alloying and Shock Consolidation T. Yamasaki, Y. Ogino, K. Fukuoka, T. Atou and Y. Syono	647
Mechanical Alloying of Nb₅Si₃ Compound and Nb-Nb₅Si₃ Alloys N.R.d. Oliveira Jr. and W.J. Botta Filho	653
Melting and Solidification of nanosized Lead Crystallites in Aluminium Studied by Means of Channeling K.K. Bourdelle, A. Johansen, E. Johnson and L. Sarholt-Kristensen	659
Improvement of the Creep Strength by Dispersion of Oxides in the Mechanically Alloyed FeAl Intermetallic K. Wolski, F. Thévenot and J. Le Coze	665
Formation of Nanocrystalline Surface Layers on Cr-Ni-Steel by a Hypervelocity Plasma Pulse Impact E. Igenbergs, K.G. Schmitt-Thomas, J. Spörer and W. Loos	673
Magneto-Mechanical Damping in Plasma Sprayed Fe-Cr-X Alloys A. Karimi, P.H. Giauque and J. Martin	679
Slowly-Cooled Bulk Amorphous Alloys A. Inoue	691
Kinetic Competition in Undercooled Liquid Metals J.H. Perepezko	701
Microstructure-Selection Maps for Droplet Solidification: Application to the System Cu-Ni A.F. Norman and A.L. Greer	707
Confusion Principle and Thermodynamics P.J. Desré	713
Undercooling Experiments on the Re-Rich Part of the Re-W System by Processing in A 48M High Drop-Tube B. Vinet, S. Tournier and P.J. Desré	723
Specific Heat and Thermodynamics of Liquid Undercooled Metals and Bulk Glass Forming Alloys H.J. Fecht, S.G. Klose and P.S. Frankwicz	729
Mode Softening in Rapidly Quenched Supersaturated Al_{96.5}Si_{3.5} J.B. Suck	735
Microstructural Development in Rapidly Solidified Ni₃ Droplets H. Assadi, M. Barth, A.L. Greer, D.M. Herlach and P. Adeva	741
Quenching and Supercooling of Refractory Metals D. Houch, V. Soares and L. Rinderer	747
Adiabatic Nucleation in Superheated Liquids M.F.d. Silveira and E. Meyer	753
Dynamic Mechanical Analysis of Zr-AlCu-Alloys at and Above the Glass Transition Temperature K. Samwer, R. Rambousky and M. Moske	761
Metastable BCC Phase Formation in the Nb-Cr-Ti System D.J. Thoma and J.H. Perepezko	769

Solid State Amorphization in the Fe-B System J. Balogh, L. Bujdosó, G. Faigel, T. Kemény and I. Vincze	775
Effect of Mo Content in Amorphous Fe-Mo-C Materials Mechanically Alloyed on their Electrical and Thermal Properties H. Ogawa, K. Omuro and H. Miura	781
A Detail Study of the Amorphisation Reaction in NiMo Alloys by Diffraction and Scattering Methods P. Rose, D.E. Banda, N. Cowlam and S. Enzo	787
Neutron Small-Angle-Scattering Studies of Metal Alloys Produced by Solid State Reaction P.P. Macrí, D.E. Banda, P. Rose, S. Enzo and N. Cowlam	793
Structure Formation and Deformation Behaviour of Multilayer Composite Prepared by Ball Milling and Repeated Pressing R. Maric, K.N. Ishihara and P.H. Shingu	801
Measurements and Simulation of Asymmetric Interdiffusion in Amorphous Ni-Zr Multilayers F.-. Yang, R.E. Somekh, W.C. Shih and A.L. Greer	807
Crystallization Kinetics of Al-Base Amorphous Alloys T. Benameur and A. Inoue	813
Crystallization Kinetics of Amorphous Ferromagnetic Fe-B-Si Alloys N. Kunitomi	827
Crystallization Kinetics of Amorphous Co₈₄Nb₁₀B₆ Ribbons O. Dor, E. Manor, I. Schwartz, A.N. Sembira, J.G. Dunn and J. Baram	833
Structural, Thermal and Electrical Properties of Al-Rich Metallic Glasses A. Rubshtein, Y. Rosenberg, A. Frenkel, V. Manov, E. Veliyulin, A. Voronel and E.A. Stern	839
Crystallization Temperature and Microhardness of Some Melt-Spun Amorphous Aluminium Based Alloys in the Al-TM-RE System M. Petrescu and M. Calin	845
Crystallization Kinetics of Cu₅₀Zr₅₀ Glass A. Pratap, A. Prasad, S.R. Joshi, N.S. Saxena, M.P. Saksena and K. Amiya	851
Configurationally Frozen Defects, Random Strains and Landau Theory of Crystals to Glass Transition M. Li, W.L. Johnson and W.A. Goddard III	855