

Table of Contents

Foreword, Organization and Sponsors, Chapter's Editors and Scientific Reviewers

Chapter 1: Synthesis

Structural Evolution of Ti-Fe-Si-B Alloys Produced by High-Energy Ball Milling and Sintering

W.L. Pereira, I.R. Bertoli, J. de Aquino Franzé, A.S. Ramos, N.A. Mariano, C.A. Nunes, E.C. Trindade Ramos and C.A. Nunes 3

Phase Transformation in Mechanically Alloyed and Hot-Pressed Ti-2Nb-22Si-11B and Ti-6Nb-22Si-11B Powder Mixtures

A.C. Zanardo, N.A. Mariano, L.B. Alkmin, A.M. da Silva Costa, C.A. Nunes and A.S. Ramos 9

Phase Transformation in Mechanically Alloyed and Hot-Pressed Nb-4Si-8B and Nb-8Si-16B Alloys

C.E. Chiaradia, L.B. Alkmin, C.Â. Nunes, V.A.R. Henriques, G.M.C. Pereira and A.S. Ramos 14

High-Energy Ball Milling and Sintering of Ti-2Ta-22Si-11B and Ti-6Ta-22Si-11B Powders Mixtures

L. Ferreira, L.B. Alkmin, É.C.T. Ramos, C.A. Nunes and A.S. Ramos 20

Effect of Mechanical Alloying on Characteristic of Powders of Ammonia Hepatamolybdate, Copper and MoCu Sintered

R.R. Silva, L. Resende, R.A.B. Assunção, F.A. Costa and U.U. Gomes 25

High-Energy Ball Milling and Hot Pressing of the Ni-48Ti-2Sn and Ni-45Ti-5Sn Powder Mixtures

L.K. Kayano, D. Murusawa, G.M. Cortez Pereira and A.S. Ramos 29

Obtainment of a NiCrNbC Alloy by Mechanical Alloying

A.K. da Silva, O.M. Cintho and J.D.T. Capocchi 35

Comparative Study of Mechanical Activation Improved by High Energy Ball Mills in Chromium Oxide Reduction

M. de Castro, O.M. Cintho and J.D.T. Capocchi 41

Synthesis of Niobium Nitride Using Cryogenic Milling

H. de Moraes Tamura, S. Vurobi, M.Y. Maeda, J.D.T. Capocchi and O.M. Cintho 46

Microstructural Characterization of 66%Co-28%Cr-6%Mo Dental Alloy Powder Obtained by High-Energy Ball Milling

C. dos Santos, A.F. Habibe, D. Rodrigues, J.C. Minatti, J.F.C. Lins and L.A. dos Santos 51

Effect of Ball-Powder Ratio in the High-Energy Milling of 66%Co-28%Cr-6%Mo Dental Alloy

C. dos Santos, A.F. Habibe, D. Rodrigues, J.C. Minatti, J.F.C. Lins and L.A. dos Santos 56

Synthesis of TiFe Compound from Ball Milled TiH₂ and Fe Powders Mixtures

R.B. Falcão, E.D.C.C. Dammann, C.J. da Rocha, R.U. Ichikawa, M. Durazzo, L.G. Martinez and R.M.L. Neto 61

Sintering of Al₄C₃ Using Aluminum Scrap and Commercial Graphite

R.E. Coelho, D.B. Silvany, M.D.C. Sobral and M.C.A. Silva 66

Study of Electrical, Mechanical and Microstructural Properties of Composites Based on Cu-Ni-Ag-Al₂O₃ Obtained by Powder Metallurgy

W.A. Monteiro, J.A.G. Carrió, E.C. Oliveira, G.G. Previatti and L.C.E. Silva 72

Electrical, Mechanical and Microstructural Properties of Copper-Chromium-Silver-Alumina Composites Obtained by Powder Metallurgy

W.A. Monteiro, J.A.G. Carrió, M.A.R. Santos, D.S. Motta and L.C.E. Silva 78

Processing of Metal Matrix AA2124 Aluminium Alloy Composites Reinforced by Alumina and Silicon Carbide by Powder Metallurgy Techniques

S.J.F. Alves, M.M.S. de Sousa, E.R. de Araújo, F.A. Filho, M.J. dos Santos and O.O. de Araújo Filho 84

Dispersion of Carbon Nanotubes in AA6061 Aluminium Alloy Powder by the High Energy Ball Milling Process

D.N. Travessa and M. Lieblich 90

Development of Fe-P Matrix Composites Containing Embedded Solid Lubricants A.I. Ramos Filho, R. Schroeder, C. Binder and A.N. Klein	96
Preparation of Molybdenum High Speed Tool Steels with Addition of Niobium Carbide by Powder Metallurgy Techniques O.O. de Araújo Filho, R.T. Antonello, C.H. Gonzalez, S.L. Urtiga Filho and F.A. Filho	102
Features of the Processing of AA2124 Aluminum Alloy Metal Matrix Composites Reinforced by Silicon Nitride Prepared by Powder Metallurgy Techniques C.A. Bezerra, A.D. Araújo de Moura, E.G. de Araújo, M.J. dos Santos and O.O. de Araújo Filho	108
A New Sintered Hard Metal Composite A.A.A. Santos, U.U. Gomes and M. Furukava	114
Characterization of Composites Based on 316 Stainless Steel and Zirconia for Use as Functionally Graded Materials V.L. Arantes, L. Grajales Agudelo and P.L. di Lorenzo	120
Nanostructured Al Powder Obtained by High Energy Ball Milling at Ambient and Cryogenic Temperatures H.M. de Lira, P.R. Rodriguez, O.O. de Araújo Filho, C.H. Gonzalez and S.L.U. Filho	125
Effect of Sintering Temperature on the Formation of Intermetallics in Al-Fe-B Nanocomposite J. Abenojar, M.A. Martínez, A.J. Criado and F. Velasco	130
Synthesis and Characterization of Silver Nanoparticles P. de Freitas Rosa, S.S. Rodrigues Cirqueira, M. Lopes Aguiar and A. Bernardo	135
Fourier Transform Infrared Spectroscopic Study of Boron-Doped Micro/Nano/Ultrananocrystalline Diamond Prepared by Chemical Vapor Deposition T.M. Arantes, N.M. Santos, A.F. Azevedo, M.R. Baldan and N.G. Ferreira	140
Nanocrystalline Diamond Films Prepared with Different Diamond Seeding Processes of 4 Nm and 0.25 Mm Diamond Powders M. Santos, R.A. Campos, A.F. Azevedo, M.R. Baldan and N.G. Ferreira	146
Boron-Doped Ultra/Nanocrystalline Diamond Films Obtained with Different Growth Times and Boron Doping Levels M. Santos, A.F. Azevedo, F.A. Souza, M.R. Baldan and N.G. Ferreira	152
Investigation of Boron Doped Nanocrystalline Diamond Films Grown on Porous Silicon Substrate under Different Doping Concentrations L.M. da Silva, M. dos Santos, A.F. Azevedo, M.R. Baldan, A.F. Beloto and N.G. Ferreira	158
Experimental Analysis of Behavior in TiO₂ Nanoparticle Suspension M.A.B.B. Souza, A. de Souza Forster, M.B. Oliveira and J.A. de Castro	163
Micro, Nano and Ultrananocrystalline Diamond Deposition D.C. Barbosa, M.R. Baldan, V.J. Trava-Airoldi and E.J. Corat	168
Evaluation of the Deposition of Nanoparticles in Fibrous Filter P.M. de Barros, S.S. Rodrigues Cirqueira and M. Lopes Aguiar	174
Characterization of Nitrogen Doped Diamond Electrodes Produced by Hot Filament Chemical Vapor Deposition N.M. Santos, T.M. Arantes, N.G. Ferreira and M.R. Baldan	180
Electric Double Layer Capacitor of Multiwall Carbon Nanotubes under Different Degree of Acid Oxidations E. Saito, V.E. Caetano, E.F. Antunes, A.O. Lobo, F.R. Marciano, V.J. Trava-Airoldi and E.J. Corat	186
Vertically Aligned Carbon Nanotubes/Carbon Fiber Composites for Electrochemical Applications E. Saito, V.E. Caetano, E.F. Antunes, A.O. Lobo, F.R. Marciano, V.J. Trava-Airoldi and E.J. Corat	192
Project and Construction of a Differential Mobility Analyzer to Produce Monosized Nanoparticles M.G. Dalcin, D.M. Nunes, J.J.R. Damasceno and F.O. Arouca	197
A CFD Study of the Air Distribution at Non-Conventional Dryers Using Different Configurations of Mini Pipes B.C. Silvério, I.A. Resende, D.B. Santos, C.R. Duarte and M.A.S. Barrozo	203
Analysis of Solid Concentration Profiles in Batch Sedimentation Tests Using Viscous Newtonian Fluids B.A. Moreira, F.d.O. Arouca and J.J.R. Damasceno	209

An Investigation of the Different Flow Regimes in a Rotating Drum through Experimental and Simulation	
D.A. Santos, I. Petri Jr., C.R. Duarte and M.A.S. Barrozo	215
Evaluation of Self Cleaning System in Aerosol Filtration Using Synthetic Filter	
A.M.M. Arouca, G.C. Gerkman, F.O. Arouca, L.G.M. Vieira and J.J.R. Damasceno	220
CFD Applied to the Analysis of Hydrodynamics in a Hydrocyclone	
I.C. Bicalho, J.L. Mognon, J. Shimoyama, C.H. Ataíde and C.R. Duarte	226
Obtaining Ceramic Filter from Rice Husk and Kaolinitic Clay	
R.P.A. Souza, F.V. Motta, R.G. Carvalho, W. Acchar, E. Harima, R. Maribondo and C.A. Paskocimas	232
Fast Pyrolysis of Soy Hulls in a Fluidized Bed Reactor: Main Components of the Bio-Oil	
T.J.P. de Oliveira, C.R. Cardoso and C.H. Ataíde	239
Analysis of the Effect of the Underflow Orifice Size on the Filtering and Concentrating Hydrocyclone	
N.K.G. Silva, F.F. Salvador, L.G.M. Vieira and M.A.S. Barrozo	245
Study of the Capacity in a Totally Permeable Hydrocyclone	
F.F. Salvador, N.K.G. Silva, M.A. de Souza Barrozo and L.G.M. Vieira	250
Experimental Study of the Hydrocyclone H11 with Rotational Feed	
D. de Oliveira Silva, F.F. Salvador, L.G.M. Vieira and M.A. de Souza Barrozo	256
Physical Properties of Cuttings, Drilling Fluid and Organic Phase Recovered in the Drying Operation in Oil and Gas Well Drilling	
M.S. Pereira, R. de Andrade Martins, A.L. Martins, M.A. de Souza Barrozo and C.H. Ataíde	262
Study of the Use of an Anionic Collector in the Mineral Wastewater Treatment by Dissolved Air Flotation	
M.A. Santos, R.C. Santana, F. Capponi, M.C. Nery, C.H. Ataíde and M.A.S. Barrozo	268
Obtaining Constitutive Equations for Thickening and Filtration Non-Newtonian Fluids	
H. de Oliveira, B.A. Moreira, J.J.R. Damasceno and F.d.O. Arouca	274
Analysis of the Compressibility of Sediments in Batch Settling Tests Using Newtonian and Non-Newtonian Fluids	
B.A. Moreira, H. de Oliveira, F.d.O. Arouca and J.J.R. Damasceno	280
Synthesis and Characterization of Barium Titanate by Solid-State Reaction	
M.C. de Andrade, G.N. Carneiro, E.L. Moreira, J.C. Araújo and V.C.A. Moraes	285
Dry Aggregate Particle Size Distribution Optimization for Soderberg Anode Paste Production Applied to Aluminum Industry	
B.F. Vry, W. Pomarico, F. Ferraco, R.S. Fernandes and S.C. Maestrelli	291
Analysis of the Collection Efficiency of Fiber Filters on the Filtration of Nano-Sized Particles from Aerosol	
D.M. Nunes, J.J.R. Damasceno and F. de Oliveira Arouca	297
Behaviour of Fluids in Porous Materials	
M.A. Martínez, F. Velasco and J. Abenobar	303

Chapter 2: Processing

Fe-hBN Composites Produced by Double Pressing and Double Sintering	
G. Hammes, P. da Costa Gonçalves, C. Binder, K.P. Furlan and A.N. Klein	311
Densification Behaviour Modelling for Metallic Powders	
M.C. dos Santos Freitas, J.A. de Castro, L.P. Moreira and F.d.P. Vitorette	317
Production of Ti-10V-2Fe-3Al for Aerospace Application from Ti-Al Pre-Alloyed Powder	
E.S.R. Araújo, J.O. Costa, R.O.P. de Lima and V.A. Rodrigues Henriques	323
Characterization of Commercial Co-Cr-Alloy Powder Used in Selective Laser Sintering	
C. dos Santos, P.C. da Silva, L.C. de Paula, A.F. Habibe, J.F.C. Lins and W. Soares	329
Influence of the Temperature in the Direct Forming Laser Process of 316L Stainless Steel with CO₂ Laser	
C.L. Santos, G. Vasconcelos, H.S. Oliveira, L.G. Oliveira, J.F. Azevedo and R. Riva	334
Selective Laser Sintering of Different Powders of Co-Cr-Mo	
C. dos Santos, P.C. da Silva, L.C. de Paula, A.F. Habibe, J.F.C. Lins and W. Soares	338

Atomization and Selective Laser Melting of a Cu-Al-Ni-Mn Shape Memory Alloy E.M. Mazzer, C.S. Kiminami, P. Gargarella, R.D. Cava, L.A. Basilio, C. Bolfarini, W.J. Botta, J. Eckert, T. Gustmann and S. Pauly	343
Performance Thermally Sprayed Coatings Tests when Subject to Adhesive Wear A.B.C. Arnt, M.R. da Rocha and G.F. Marangoni	349
Plasma Sintering-Carburizing of 410 LHC Steel in Carbon Containing Atmosphere S.F. Brunatto, A. Meier, S. Henke, C. Binder and A.N. Klein	353
Characterization of the AISI 304 Alloy Treated in a Large Vacuum Chamber PIII System with a New HV Pulser A. Ribeiro da Silva, M. Ueda, J.O. Rossi, M.M.N.F. da Silva, M. do Santos Maciel and L. Pichon	359

Chapter 3: Properties

Evaluation of Heat Absorption in Iron Ore Using Microwave Energy Source L.M. Silva, M. Nascimento, I.O. Mota, M.T. Fernandes and J.A. Castro	367
Mechanical Characterization of a Steel AISI 43100 Submitted to Different Routes of Heat Treatments A.L. Frade Drumond, A.J. Abdalla, C. de Moura Neto, T. Manabu Hashimoto and L.R. de Oliveira Hein	373
Thermal Treatment and Improvement of Tribological Properties of Automotive Ring by Laser Methods H.S. de Oliveira, C.L. Santos, V. Teleginski and G. Vasconcelos	377
Influence of Temperature on Ductile-Fragile Behavior C.A. Silva, R.C.R. Nascimento, M.S. Martins and M.C.S. Freitas	383
Adherence Analysis of DLC Films Grown on AISI M2 Steel Substrates as a Function of Silicon Interlayer Thickness P.C.S. da Silva, G.V. Martins, L.A. Pereira, E.J. Corat and V.J. Trava-Airoldi	388
Friction and Wear Behavior Evaluation of DLC Films Grown in Multilayer of Carbon and Silicon P.C.S. da Silva, G.V. Martins, E.J. Corat and V.J. Trava-Airoldi	392
Study of Cooling Rate Influence on SAF 2205 Duplex Stainless Steel Solution Annealed M.E.R. Cronemberger, N.A. Mariano, M.F.C. Coelho, J.N. Pereira, É.C.T. Ramos, R. de Mendonça, S. Nakamatsu and S.C. Maestrelli	398
Study of Sintering of Iron Powder Bars Processed by Equal Channel Angular Pressing M.P. Ribeiro, M.F. Hupalo, S. Vurobi and O.M. Cintho	404
Interface Evaluation of MCrAlY Powder Bond Coat on 316 SS Processed with Laser Irradiation V. Teleginski, D.C. Chagas, L.G. de Oliveira and G. de Vasconcelos	409
Sintering Studies and Microstructural Evolution of Fe-MoS₂ Mixtures K.P. Furlan, J.Z. de Assunção, G. Paz, C. Binder and A.N. Klein	415
Microstructure and Electrochemical Characteristics of LaPrMgAlMnCoNi Hydrogen Storage Alloys for Nickel-Metal Hydride Batteries L.M.C. Zarpelon and R.N. Faria Jr	421
Self-Discharge and Microstructure of Supercapacitors Tested at Room Temperature and at 333 K V.R. Spina Visentini, L.M. Carlotti Zarpelon and R.N. Faria Jr	427
Effects of Sodium Nitrite, Sodium Dichromate and Benzoic Acid as Inhibitors in the Protection of Mild Steel in Water J.W. de Jesus Silva, A.P.O. Belo, R.B. Ribeiro and N.T. Matias	433
A Comparative Study of Biomimetic Coatings on Titanium and Stainless Steel M.F.C. Coelho, M.E.R. Cronemberger, J.N. Pereira, S. Nakamatsu, S.C. Maestrelli, E.C. da S. Rigo and N.A. Mariano	440
Analysis of Surface and Profile of Pits in Austenitic Stainless Steel AISI 310S by Optical Microscopy R.B. Ribeiro, J.W. de Jesus Silva, L.R. de Oliveira Hein, E.N. Codaro and N.T. Matias	446
Effect of Plasma Nitriding on Creep Behavior at 550 °C of a Maraging Steel (300 Grade) Solution Annealed A.G. dos Reis, D.A.P. Reis, A.J. Abdalla and J. Otubo	452

Effect of Heat Treatment on Microstructure and Mechanical Properties of Ti-13Nb-13Zr Alloy Produced by Powder Metallurgy	
J.H. Duvaizem, N.M.F. Mendes, J.C.S. Casini, A.H. Bressiani and H. Takiishi	457
Comparison between Laser Surface Nitriding and Nitrogen Plasma Immersion Ion Implantation (N-PIII) on Creep Behavior of Ti-6Al-4V Alloy	
D.A.P. Reis, A.G. dos Reis, L.M. Yogi, M.M. da Silva, M. Ueda and S. Zepka	462
Spark Plasma Sintering and Hot Compression Analysis of Pure Mg and AZ91 Alloy	
P.A. de Oliveira Botelho, G. Straffelini and C. Menapace	467
Comparative Study of Creep Resistance of a Ti-6Al-4V Alloy with Metallic and Ceramic Coatings	
F.P. Briguente, L.A.N. da Silva Briguente, D.A.P. Reis and M.M. da Silva	472
Effects of Hydrogen Content in Nitrogen-Based Sintering Atmosphere on Microstructure and Mechanical Properties of Fe-0.3%C-0.1%B Alloy	
A. Loberto, M.d.C.A. da Silva, F. Ambrozio Filho, D.Z. de Florio and H.N. Yoshimura	477
Influence of High Temperature Sintering on Impact Properties of Low Alloyed Steels	
C. Menapace, G. Cipolloni and A. Molinari	483

Chapter 4: Applications

Preparing Magnetocaloric LaFeSi Uniform Microstructures by Spark Plasma Sintering	
N. Vicente, J. Ocanã, H.N. Bez, C.S. Teixeira, I.F. Machado and P.A.P. Wendhausen	491
Characterization of Porous Ti-35Nb Alloy Sintered at Different Temperatures for Implant Applications	
C.S.S. de Oliveira, A. Antunes Ribeiro, A.A. Ribeiro, R.M. Balestra, S. Griza and M.V. de Oliveira	496
Quantitative Analysis of Titanium Samples by Means of the Pore-Throat Network Code Application	
C.M. Anderson, P.K. Denise, A.R. Cunha, A.A. Ribeiro, M.V. de Oliveira and C.P. Fernandes	501
Chemical, Structural and Mechanical Study of Metallic Biomaterials Used in Hip Arthroplasty	
F.P. Filho, C.R. da Silva Morais, K.V.M. de Campos, J.J. da Silva Nascimento and J. da Silva Burit	507
Characterization of Titanium Powders Processed at Different Temperatures	
A.A. Ribeiro, R.M. Balestra, T.S. Barros, S.S. Carvalho, L.R. Guzela, C. Barbosa, I.C. Abud, M.V. Oliveira, J.C. Garcia de Blas and L.C. Pereira	512
Microstructural Characterization of a High Copper (Nd_{0.75}Pr_{0.25})₂Fe₁₄B Magnet	
M.F. de Campos, D. Rodrigues, F.P. Vitoretti, L.V. Tavares, K.S.T. de Souza and J.A. de Castro	518
Sintered Fe₅₀Ni Alloy Produced by Mixing Iron and Nickel Powders	
D. Rodrigues, G.V. Concílio, N.K. Filho, J.A. de Castro and M.F. de Campos	524
Effects of Order-Disorder Reactions on the Magnetic Properties of Rapidly Quenched Fe-6.5% Si Alloy	
F.A. Nascimento and M.C.A. da Silva	530
Superparamagnetic Iron Oxide Nanoparticles for Magnetic Hyperthermia: Synthesis, Surface Modification by Polyethylene Glycol and Characterization	
F.A. Sampaio da Silva, E.E.G. Rojas, S. Romero and M.F. de Campos	535
Grain Growth Kinetics of (NdPr)₂Fe₁₄B Magnets	
K.S.T. de Souza, C. de Jesus Marcelo, D. Rodrigues, J.A. de Castro and M.F. de Campos	540
Influence of the Grain Size on the Dysprosium Diffusion in NdFeB Magnets	
J.A. de Castro and M.F. de Campos	546
Frequency Characterization of Ferrite Beads in the Microwave Range for Nonlinear Applications	
L.P. Silva Neto, J.O. Rossi, P.A.G. Dias and J.J. Barroso	552
Relation between Initial Magnetization Curve and Grain Size of Nanocrystalline NdFeB Magnets	
M.F. de Campos, F.A.S. da Silva and J.A. de Castro	558
Coercivity Mechanism in Hard and Soft Sintered Magnetic Materials	
M.F. de Campos	563
Magnetic Domains Observation from Bitter Patterns of NdFeB Alloy	
R. Lemos, K.S.T. de Souza, F.A.S. da Silva, D. Rodrigues, J.A. de Castro and M.F. de Campos	569

Feasibility Study for Feedstock Recycling on PIM Nd-Fe-B Permanent Magnets L.U. Lopes, P.V. de Souza Lia Fook, A. Owczarzak, N. Uenal, T. Hartwig and P.A.P. Wendhausen	574
A Simple Device for Measuring Losses in Soft Magnetic Materials W.S. Marinho, M.F. de Campos and J.C. Teixeira	579
NdFeB Type Magnets Produced by Spark Plasma Sintering M.A. Campos, N. Vicente, I.F. Machado, K.S.T. de Souza, D. Rodrigues and M.F. de Campos	585
Thermal Analysis Investigation of NdFeB Bonded Magnets D. Rodrigues, G.V. Concílio, E.P. da Rocha, J.A. de Castro and M.F. de Campos	590
Upper Limit for the Coercive Force in NdFeB and PrFeB Magnets M.F. de Campos, F.A.S. da Silva and J.A. de Castro	596
Squareness of NdFeB Stoner-Wohlfarth Hysteresis M.F. de Campos, F.A.S. da Silva and J.A. de Castro	601
Modeling the Neodymium Metallic Reduction from Molten Salts J.A. de Castro and M.F. de Campos	607
Virtues and Weakness of Brown Micromagnetics M.F. de Campos	613
Heat Treatment Design for NdFe and SmCo₅ Magnets with Basis on the Phase Diagram M.F. de Campos	619
Application of Nanoparticle Tracking Analysis (NTA) in Aqueous Solutions of TiO₂ E.M. de Oliveira, I.C.R.P. Valadão, A. de Souza Forster Araújo and J.A. de Castro	624
MSW Leachate Inorganic Ion Diffusion through Compacted Soil and HDPE Geomembrane Barrier - Laboratory Experiments and Model Validation I.C.R.P. Valadão, E. Ritter and J.A. Castro	630
Predictions of Xylene Adsorption on Agglomerated Activated Carbon Pellets in a Fixed Bed Column I. de Oliveira da Mota, L.M. da Silval and J.A. de Castro	636
Adherence Study of Diamond-Like Carbon Films Deposited on X45 CrSi 9-3 Steel with a Silicon Interlayer L.A. Pereira, M.B. de Mattos, E.J. Corat and V.J. Trava-Airoldi	642