

Table of Contents

Preface, Organization and Sponsors

Chapter 1: Formability of Metallic Materials

Flow Localization Modelling in Ti Alloys and Ti Matrix Composites D. Halici and C. Poletti	3
Effect of Equivalent Stress-Strain Relation and Differential Hardening on Accuracy of Forming Limit Analyses T. Hakoyama and T. Kuwabara	9
Formability of a Magnesium Alloy AZ31B Deformed under Channel Die Compression Tests: Macroscopic Shearing of Specimens H. Francillette and F. Marco	15
A Comparative Study of Forming Limit Diagrams Predicted by Two Different Plasticity Theories Involving Vertex Effects H.K. Akpama, M. Bettaieb and F. Abed-Meraim	21
Effect of Stress State and Temperature on the Kinetics of Martensitic Phase Transformation in TRIP-Assisted Steel H.G. Kim, J.W. Lee, F. Barlat, D.Y. Kim and M.G. Lee	27
Simulation and Modeling of Sintering Process for 316L Stainless Steel Metal Injection Molding Parts M. Sahli, J.C. Gelin and T. Barrière	32
Comparison of 15Cr-15Ni Austenitic Steel Cladding Tubes Obtained by HPTR Cold Pilgering or by Cold Drawing L. Courtin, S. Urvoy, D. Bossu, S. Bosonnet, M. Tabarant, B. Kedjar, P. Olier and L. Thilly	38
Warm Forming and Paint Bake Response of AW-7xxx Sheet in Various Tempers M. Kumar and N. Ross	47
Microstructure in Unbent and As-Hot Bent Segments of Thick-Walled P92 Steel Pipe P. Král, V. Sklenička, K. Kuchařová, M. Kvapilová, M. Svobodová and L. Horvath	53
Experimental Investigation of Heat-Treated Aluminum Profiles M. Merklein, M. Graser and M. Lechner	59
Study of Localized Thinning of Copper Tube Hydroforming in Square Section Die: Effect of Friction Conditions A. Abdelkefi, N. Boudeau, P. Malecot, N. Guermazi and G. Michel	65
New Criterion for Prediction of the Wrinkle Formation in Deep Drawing Process M. Liewald, F. Han and R. Radonjic	71
Numerical Prediction Model of Temperature Effect on DP1000 Steel Damage during Warm Formability O. Keita, P.A. Dubos, J. Chottin and E. Hug	77
Work-Hardening Behavior of Cold Rolled Interstitial-Free Steel Sheet and Dual Phase High Strength Steel Sheets Subjected to Two-Stage, Coaxial and Non-Coaxial Tension/Compression S. Shirakami, S. Yonemura, T. Yoshida, N. Suzuki and T. Kuwabara	83
Diffusion Effects Induced by Dislocations in Crystalline Materials Subjected to Large Strains R. Paşcan and S. Cleja-Țigoiu	89
Predictive Performances of FLC Using Marciniak-Kuczynski Model and Modified Maximum Force Criterion D. Banabic, L. Lazarescu and D.S. Comsa	96
Experimental Waviness Evolution of Interstitial Free - IF Steel Sheet under Biaxial Stretching J.D. Bressan and R.K. Unfer	102
Evaluation of Friction at High Strain Rate using the Split Hopkinson Bar A. Forcellese, E. Mancini, M. Sasso and M. Simoncini	108

High Strain Rate Behaviour of AA7075 Aluminum Alloy at Different Initial Temper States M. Sasso, A. Forcellese, M. Simoncini, D. Amodio and E. Mancini	114
Hot Deformation Behavior of a 3rd Generation Advanced High Strength Steel with a Medium-Mn Content K. Steineder, M. Dikovits, C. Beal, C. Sommitsch, D. Krizan and R. Schneider	120
Strain-Path Effects on the Formability Behavior of Interstitial-Free Steel J.L. Ferreira, J.O.A. Tepedino, M.A. Wolff and L.P. Moreira	126
High-Speed Cropping of Rods and Wire with Superposition of Various Stress Conditions R. Henry and M. Liewald	132
An Engineering Approach to Strain Rate and Temperature Compensation of the Flow Stress Established by the Hydraulic Bulge Test J. Mulder, H. Vegter and T. van den Boogaard	138
Physically Based Criterion for Prediction of Instability under Stretch-Bending of Sheet Metal S. Perdahcioglu, B. Hou and T. van den Boogaard	144
A Comparative Study on the Formability Prediction of Steel Sheets by Anisotropic Models Based on Associated Flow Rule and Non-Associated Flow Rule J.H. Lian, D.C. Ahn, D.C. Chae, S. Münstermann and W. Bleck	150
Research of Dynamic Recrystallization Processes in Heat-Resistant Ni-Based Alloy O.G. Zotov, A.I. Shamshurin, A.A. Kononov and A.A. Naumov	156
Anisotropic Behavior in Plasticity and Ductile Fracture of an Aluminum Alloy Y.S. Lou and J.W. Yoon	163
A Comparative Study of the Identification Methods for Tube Hydroforming Process T. Zribi, A. Khalfallah and H.B. Salah	169
Deformation Characteristics of Advanced High Strength Steel under Cyclic Bending and Reversed Bending F.K. Chen, S.L. Lin, H.K. Tsai, Y.W. Lin and I.K. Lin	175
Curvature Based Forming Limit Prediction of High-Strength Steel Components with Superimposed Stretching and Bending in the Deep Drawing Process D. Schalk-Kitting, W. Weiß, B. Suhr and M. Koplenig	181
Lode Parameter Dependence and Quasi-Unilateral Effects in Continuum Damage Mechanics: Models and Applications in Metal Forming C. Soyarslan, H. Richter and S. Bargmann	187
Forming Limit Diagram Predictions Using a Self-Consistent Crystal Plasticity Model: A Parametric Study Y. Jeong, M.S. Pham, M. Iadicola and A. Creuziger	193
Room Temperature Forming of AA7075 Aluminum Alloys: W-Temper Process E. Sáenz de Argandoña, L. Galdos, R. Ortubay, J. Mendiguren and X. Agirretxe	199

Chapter 2: Forging and Rolling

Numerical Modeling of Thermal Evolution in Hot Strip Rolling of Magnesium Alloy A. Nam, U. Prüfert, M. Eiermann and R. Kawalla	207
Sheet Metal Rolling of Molybdenum: Thermo-Mechanical FEM Simulations J. Schäfer, M. Schober and A. Plankensteiner	213
Validation of a FEM Model for the Simulation of the Cold Roll Forming Process A. Formisano, F. Capece Minutolo, A. Caraviello, L. Carrino, M. Durante and A. Langella	219
Metallurgical Evolutions in Hot Forging of Dual Phase Titanium Alloys: Numerical Simulation and Experiments A. Ducato, G. Buffa, A. Astarita, A. Squillace, L. Fratini and F. Micari	225
Experimental Characterization and Modeling of Residual Stress Gradients across Straight and Bent Seamless Steel Tubes G. Winter, J. Klarner, P. Staron, B. Buchmayr and J. Keckes	231
Numerical Modelling of Damage Evolution in Ingot Forging P. Christiansen, P. Martins, N. Bay and J. Hattel	237
Technological Investigation of Clad Sheet Bonding by Hot Rolling G. Szabó, V. Mertinger, I. Zupkó and T. Mikó	243

Speed Idle Roll Law Optimization in a Ring Rolling Process L. Giorleo, E. Ceretti and C. Giardini	248
Design of Rotary Extrusion Process Using Simulation Techniques to Save Raw Material in Hollow Components Á. Mangas, M. Santos, J.I. Zarazua and I. Pérez	254
Physical Simulation of Pipes Production Cycle for Lean Alloyed Pipeline Steel X80 A.A. Naumov, Y.A. Bezobrazov and E.V. Chernikov	260
First Experimental and Numerical Study on the Use of Sheet Metal Die Covers for Wear Protection in Closed-Die Forging D. Rosenstock, E.T. Segebadé and G. Hirt	266
Experimental and Numerical Investigation on Controlling the Material Flow in Open-Die Forging through Superimposed Manipulator Displacements M. Wolfgarten, D. Rosenstock, J. Freitag and G. Hirt	272
Measurement of Radial-Axial Rolled Rings by Using Image Processing and Thermography T. Husmann and D. Kreimeier	278
Mechanical Properties in Hot Forged Steel Parts in Relation to Properties in Corresponding Parts Made by Casting Solely H. Valberg, M. Langøy and M. Nedreberg	284
Modelization of the Rolling Mill with a FE Code D. Chevalier, P. Cezard, L. Langlois and R. Bigot	291
Experimental Investigations on the Relation of the Lubricant's Flash Point and Quality of the Piston Made from Aluminium Alloy for its Application in Internal Combustion Engines M.A. Petrov, T.S. Basyuk, P.A. Petrov and A.N. Petrov	297
Experimental Investigations and Automatic Numerical Optimization of a Bulk Metal Forming Process to Avoid Forging Folds B.A. Behrens, S.M. Bouguecha, M. Vucetic, A. Bouguecha and M. Kazhai	305
Alternative Temperature Control of Closed Forging Dies Using Heat Pipes B.A. Behrens and T. Prüß	311
Investigation of the Operational Reliability of the Rolled Rails According to the Various Technologies N.G. Kolbasnikov, O.G. Zotov and A.A. Lukyanov	317

Chapter 3: Composites Forming Processes

Internal Structure of the Sheared Textile Composite Reinforcement: Analysis Using X-Ray Tomography M. Barburski, I. Straumit and S. Lomov	325
Fluid-Long Fiber Interaction Based on a Second Gradient Theory M. Perez, E. Abisset-Chavanne, E. Cueto, R. Keunings and F. Chinesta	331
Numerical Prediction of Internal Stresses due to Weaving E. Vidal-Salle, C. Florimond and P. Boisse	338
Efficient Solid-Shell Finite Elements for Quasi-Static and Dynamic Analyses and their Application to Sheet Metal Forming Simulation P. Wang, H. Chalal and F. Abed-Meraim	344
Characterisation of Tensile Properties Perpendicular to Fibre Direction of a Unidirectional Thermoplastic Composite Using a Dynamic Mechanical Analysis System A. Margossian, S. Bel, L. Avila Gray and R. Hinterhölzl	350
The Bending Behaviour Characterisation of Thermoplastic Prepregs and its Influence on the Wrinkling B. Liang, N. Hamila and P. Boisse	356
An Inverse Finite Element Approach to Calculate Full-Field Forming Strains R. Ritt, M. Machado, M. Fischlschweiger, Z. Major and T. Antretter	363
Bias Extension Test for In-Plane Shear Properties during Forming - Use at High Temperature and Limits of the Test P. Boisse, P. Wang, N. Hamila, K. Lemeur, A. Rusanov, E. Guzman, M. Ferretti, M. D'Agostino and A. Madeo	369
Investigation of the Residual Stress State in an Epoxy Based Specimen I. Baran, J. Jakobsen, J.H. Andreasen and R. Akkerman	375

Inter-Ply Friction Effect on the Forming Result of Multi-Layered Composite S. Allaoui, G. Hivet and C. Cellard	381
Thermoforming Modelling and Simulation of Multilayer Composites with Continuous Fibre and Thermoplastic Matrix E.G. Maldonado, N. Hamila, P. Boisse, P. Wang and P. Chaudet	387
Kinematic Drape Algorithm and Experimental Approach for the Design of Tailored Non-Crimp Fabrics H. Krieger, D. Kaufmann and T. Gries	393
A Novel Method for Determining the Stiffness of a Composite Structure Resulting from the Manufacturing Process Using a Discrete Mesoscopic Finite Element Model C.J. Mitchell, J.A. Sherwood, L.M. Dangora and J.L. Gorczyca	399
Manufacture of Carbon Nanotube-Grafted Carbon Fiber Reinforced Thermoplastic Composites M.C. Sung, G.S. Lee, S.Y. Lee, S.I. Jeon, C.H. Ahn, J.H. Youk, J.Y. Lee and W.R. Yu	405
Shear Characterization of a Thermoplastic Cross-Ply Prepreg L.M. Dangora, J.A. Sherwood, J.C. Parker and C.J. Mitchell	409
Finite Element Simulations for CFRP Press Forming Process Y.S. Kim, D.T. Do, D.C. Ahn and D.W. Shin	415
Numerical Filling Predictions and Mechanical Mold Simulations for Composite Manufacturing Techniques: RTM Tool Development H. Grössing, S. Konstantopoulos and R. Schledjewski	423
A Contribution on Manufacturing Process Development for Composite Material Forming P. Mayer, H. Perrin, E. Becker, L. Langlois and R. Bigot	433
Experimental Test and FEA of a Sheet Metal Forming Process of Composite Material and Steel Foil in Sandwich Design Using LS-DYNA B.A. Behrens, M. Vucetic, A. Neumann, T. Osiecki and N. Grbic	439
Path Definition for Tailored Fiber Placement Structures Using Numerical Reverse Draping Approach P. Bohler, S. Carosella, C. Goetz and P. Middendorf	446
Locking and Enrichment Strategies D.J. Wolthuizen and R. Akkerman	452
A Parametric Study on Compression Molding of Reference Parts with Integrated Features Using Carbon Composite Production Waste M.I. Abdul Rasheed, B. Rietman, H.A. Visser and R. Akkerman	458

Chapter 4: Friction and Wear in Material Processing

Nano-Structured Tungsten Carbide Coating Reduces Wear of Tooling for Extrusion and Abrasive Materials Forming Y. Zhuk	467
Investigation of the Suitability of Surface Treatments for Dry Cold Extrusion by Process-Oriented Tribological Testing M. Teller, M. Bambach, G. Hirt, I. Ross, A. Temmler, R. Poprawe, H. Bolvardi, S. Prünte and J.M. Schneider	473
Development of a New Ecological Lubrication System for Sheet Metal Forming Based on CO₂ in Liquid M. Singer, M. Liewald and A. Feuer	480
Towards a Fracture Energy Based Approach for Wear Prediction of WC-Co Tools in Industrial Cold Heading Process C. Debras, A. Dubois, M. Dubar and L. Dubar	486
Complementary Approaches for the Numerical Simulation of the Micro-Plasto-Hydrodynamic Lubrication Regime C. Hubert, A. Dubois, L. Dubar, M. Laugier, N. Legrand, R. Boman, J.P. Ponthot and Y. Carretta	492
Evaluation of Tooth Surface Micro-Finishing on Gear Noise S. Jolivet, S. Mezghani, J. Isselin, A. Giraudeau, M. El Mansori and H. Zahouani	498
Fretting Fatigue on Thin Sheets E.L. Gaertner, J.D. Bressan and A.K. Petry	504

Feasibility Analysis of Lubrication through Magneto-Rheological Fluids in Sheet Metal Forming Processes F. Medea, A. Ghiotti and S. Bruschi	510
Dry Forming of Aluminium Sheet Metal: Influence of Different Types of Forming Tool Microstructures on the Coefficient of Friction P. Scholz, R. Börner, R. Kühn, R. Müller and A. Schubert	516
To the Question on the Friction Assessment Methods Applied for Metal Forming Operations M.A. Petrov, P.A. Petrov and R.R. Yafaev	522

Chapter 5: Continuum Constitutive Modelling and Scale Transition Modelling

Multiscale Simulation of Polymer Nanocomposites in Processing: Challenges and Outlooks A. Gooneie, H. Mattausch, A. Witschnigg, S. Schuschnigg and C. Holzer	533
Implementation of a Constitutive Model for the Mechanical Behavior of TWIP Steels and Validation Simulations A. Erhart, A. Haufe, A. Butz, M. Zapara and D. Helm	539
Analysis of Steel Phase Transformations Using a Multiscale Transient Model B. Barroqueiro, J. Dias-de-Oliveira and A. Andrade-Campos	545
Measurement and Analysis of the Differential Hardening of Ultralow Carbon Steel Sheets C. Sekiguchi, M. Saito and T. Kuwabara	552
Implicit Stress Integration and Consistent Tangent Matrix for Yoshida's 6th Order Polynomial Yield Function Combined with Yoshida-Uemori Kinematic Hardening Rule H. Hamasaki, F. Yoshida and T. Uemori	558
Comparison of the Johnson-Cook and VPSC Models to Describe the Constitutive Behaviour of Ti-6Al-4V in an Implicit Finite Element Scheme J.G. López, P. Verleysen, S. Naghdy and L.A.I. Kestens	564
Prediction of 3D Microstructure and Plastic Deformation Behavior in Dual-Phase Steel Using Multi-Phase Field and Crystal Plasticity FFT Methods A. Yamanaka	570
Assessment of Damage and Anisotropic Plasticity Models to Predict Ti-6Al-4V Behavior C.F. Guzmán, V. Tuninetti, G. Gilles and A.M. Habraken	575
Validation of Cellular Automata Model of Dynamic Recrystallization M. Sitko, Ł. Madej and M. Pietrzyk	581
Modelling Microstructure Evolution in Polycrystalline Aluminium – Comparison between One- and Multi-Parameter Models with Experiment J. Kreyca, A. Falahati and E. Kozeschnik	587
Application of Rheological Model of Material with Microdefects and Nanodefects with Hydrogen in the Case of Cyclic Loading Y.A. Yakovlev, A. Belyaev and V. Polyanskiy	592
Young's Modulus Determination: Influence of Microplasticity and Pseudo-Elasticity on Metal Forming P. Balland, L. Tabourot, L. Bizet, N.A. Sene, C. Depres, T. Balan and P.Y. Manach	598
Rheological Model of Materials with Defects Containing Hydrogen A. Belyaev, V. Polyanskiy and Y.A. Yakovlev	604
Evaluation of Bendability of Hot-Rolled S960 Grade Steel Using Optical Strain Measurements and FE-Modelling A.M. Arola, A.J. Kaijalainen and V. Kesti	610
Advances in Level-Set Modeling of Recrystallization at the Polycrystal Scale - Development of the Digi-μ Software B. Scholtes, M. Shakoor, N. Bozzolo, P. Bouchard, A. Settefrati and M. Bernacki	617

Chapter 6: Nano-Structured Materials and Micro Forming

Grain Size Modification by Micro Rotary Swaging S. Ishkina, B. Kuhfuss and C. Schenck	627
---	-----

Investigation of Tribological Properties of AlMg4,5Mn0,7 in a Warm Forming Process Using the Barrel Compression Test	
B. Müller, S.F. Jahn, R. Fang and A. Schubert	633
The Effect of Severe Plastic Deformation Processing on Creep Properties of Metallic Materials	
J. Dvořák, P. Král, V. Sklenička, M. Svoboda and M. Kvapilová	639
Investigation of Deformation Induced Martensitic Transformation during Incremental Forming of 304 Stainless Steel Wires	
B. Kuhfuss, E. Moumi, B. Clausen, J. Epp and B. Koehler	645
Tailored Sheared Blanks Produced by Incremental ECAP	
A. Rosochowski, L. Olejnik and M. Rosochowska	651

Chapter 7: Additive Manufacturing and Non-Conventional Processes

Analyzing the Electrical Pulses Occurring during EDM of Non-Conductive Si₃N₄ Ceramics	
N. Ojha, F. Zeller, C. Mueller and H. Reinecke	659
Microstructure and Mechanical Properties of Inconel 718 Produced by SLM and Subsequent Heat Treatment	
A.A. Popovich, V.S. Sufiiarov, I.A. Polozov and E.V. Borisov	665
Selective Laser Melting on Aluminum Foam Surface and Mechanical Properties of Fabricated Aluminum Foam with Nonporous Surface Layer	
R. Matsumoto, S. Kanatani and H. Utsunomiya	671
Microstructure and Mechanical Properties of Ti-6Al-4V Manufactured by SLM	
A. Popovich, V. Sufiiarov, E. Borisov and I.A. Polozov	677
Some Issues Regarding Finite Element Modelling of Micro-Electrical Discharge Machining Aided by Ultrasonics	
D. Ghiculescu, N. Marinescu, O. Alupeu and N. Carutasu	683
Numerical and Experimental Investigation of a Modified Twin Roll Strip Casting Process for the Production of Clad Steel Strips	
M. Vidoni, M. Daamen and G. Hirt	689
Material Loadings during Electrochemical Machining (ECM) - A First Step for Process Signatures	
F. Klocke, S. Harst, L. Ehle, M. Zeis and A. Klink	695
Energetic Consideration of the Spark Erosion Using Different Process Energy Sources and Pulse-Unit-Gap Conditions	
H.P. Schulze	701
Tailor-Made Forging Tools by Laser Metal Deposition	
D. Junker, O. Hentschel, M. Schmidt and M. Merklein	707
Mechanical Testing of Additive Manufactured Metal Parts	
M. Merklein, R. Pletke, D. Junker, A. Schaub and B. Ahuja	713
CNT and Graphene Filled Shape Memory Foams by Solid State Foaming	
L. Santo, G.M. Tedde, F. Quadrini and I. Mutlay	719
Modeling, Identification and Simulation of the Sintering Stage for Micro-Bi-Material Components	
H.B. Ou, M. Sahli, T. Barrière and J.C. Gelin	726
Process Design in Pulse Electrochemical Machining Based on Material Specific Data – 1.4301 and Electrolytic Copper as an Example	
P. Steuer, A. Rebschläger, A. Ernst and D. Bähre	732
Optimization of the Wire Electrical Discharge Machining Process Using Grey Relational Analysis and Taguchi Method	
O. Dodun, V. Merticaru, L. Slatineanu and M. Coteață	738
Parametric Analysis of Micro Electrical Discharge Milling Process of Non-Conductive Silicon Carbide	
F. Zeller, N. Ojha, C. Müller and H. Reinecke	744
A Review of Flow Forming Processes and Mechanisms	
D. Marini, D. Cunningham and J. Corney	750
Micro Electrical Discharge Machining of Tungsten Carbide with Ultra-Short Pulse	
O. Kroening, M. Herzig, M. Hackert-Oschätzchen, R. Kühn, H. Zeidler and A. Schubert	759

Effect of Pass Number, Rotational and Traverse Speed on Particle Distribution and Microstructure of AZ31/SiC Composite Produced by Friction Stir Processing A.H. Jabbari, M. Sedighi, R. Vallant, A. Huetter and C. Sommitsch	765
Microstructure Evolution and Hardness Distribution in Al Wires Subjected to Simultaneous Tension-Torsion Deformation M. Pourbashiri, M. Sedighi, C. Poletti and C. Sommitsch	771
Effect of Additive Manufactured Metallic Structures on Laser-Based Thermal Joining of Thermoplastic Metal Hybrids P. Amend, O. Hentschel, C. Scheitler, A.I. Gorunov and M. Schmidt	777
Hybrid Processing of AZ91 Magnesium Alloy/Nano-Al₂O₃ Composites S.D. Yadav, P.P. Bhingole, G.P. Chaudhari, S.K. Nath and C. Sommitsch	783
Tailor Tempering and Hot-Spotting of Press Hardened Boron Steels L. Galdos, E. Saenz de Argandoña, J. Mendiguren, N. Herrero, R. Ortubay, X. Agirretxe and J.M. Martín	789
Surface Modification of Pure Magnesium and Magnesium Alloy AZ91 by Friction Stir Processing A. Hütter, W. Huemer, C. Ramskogler, F.G. Warchomicka, A. Lachehab, R. Vallant and C. Sommitsch	796

Chapter 8: Structures, Properties and Processing of Polymers (and Biomass Based Materials)

Injection Blow Moulding Single Stage Process – Approach of the Material Behaviour in Process Conditions and Numerical Simulation J. Biglione, Y. Bereaux, J.Y. Charneau, R.G. Rinaldi, J. Balcaen and S. Chhay	805
The Use of a New Viscous Process in Constitutive Models of Polymers J. Sweeney and P.E. Spencer	812
Development and Characterization of Polymer Mixture (Binder) Based on Polyethylene Glycol (PEG) for a Superalloy A-286 to Powder Injection Moulding (MIM) Process A. Royer, J.C. Gelin and T. Barrière	824
Effect of Surface State of Die on Flow Rate of Steamed Bamboo Powder in Thermal Flow Test Using Capillary Rheometer S. Kajikawa, R. Sakagami and T. Iizuka	830
Influence of Copolymer Architecture on Generation of Defects in Reactive Multilayer Coextrusion A. Bondon, K. Lamnawar and A. Maazouz	836
Experimental and Numerical Analysis of Liquid-Forming J. Zimmer, D. Klein and M. Stommel	842
Numerical Implementation of a Rheology Model for Fiber-Reinforced Composite and Viscous Layer Approach for Friction Study L.F. Salazar Betancourt, P. Laure, L. Silva and M. Sager	848
Influence of the Variothermal Process Control on Thermoforming of Micro-Structures C. Hopmann and J. Martens	855
Foam Injection Moulding of PE/EVA Blends with an Azodicarbonamide Agent R. SPINA	863
Determining Volumetric Strain in Biaxial Deformation of PET at Temperatures and Strain Rates for Stretch Blow Moulding J. Nixon and G. MENARY	869

Chapter 9: Integrated Design, Modelling and Reliability Assessment in Forming (I-DMR)

Integrated FEM-DBEM Simulation of Crack Propagation in AA2024-T3 FSW Butt Joints Considering Manufacturing Effects M.R. Sonne, P. Carlone, R. Citarella and J.H. Hattel	877
Development of a Global Indicator to Assess Mechanical Tests N. Souto, S. Thuillier and A. Andrade-Campos	883

Computational Analysis of the Interaction between Impregnation, Forming and Curing in Pultrusion	
P. Carlone, I. Baran, R. Akkerman and G.S. Palazzo	889
Failure Performance Analysis of Resistance Spot Welded Advanced High Strength Steel Sheets	
W.R. Noh, Y.W. Koh, J.H. Hong, X. Yang and K.S. Chung	895
Effect of the Process Parameters on the Geometrical Defects of Ti-6Al-4V Hot Rolled Sheets Laser Beam Welded	
L. Boccarusso, G. Arleo, A. Astarita, F. Bernardo, P. de Fazio, M. Durante, G. Giudice, F.M.C. Minutolo, R. Sepe and A. Squillace	901
Mechanical and Tribological Characterization of Composite Laminates Manufactured by Liquid Composite Molding Processes	
M. Merola, P. Carlone, A. Ruggiero and V.M. Archodoulaki	907
An Innovative Method to Produce Metal Foam Using Cold Gas Dynamic Spray Process Assisted by Fluidized Bed Mixing of Precursors	
F. Rubino, P. Ammendola, A. Astarita, F. Raganati, A. Squillace, A. Viscusi, R. Chirone and L. Carrino	913
Numerical Simulation of AA2024-T3 Friction Stir Welding (FSW) Process: Sensitivity Analyses and Influence of Decisions during Modelling Stages	
R.M.F. Paulo, P. Carlone, R.A.F. Valente, F. Teixeira-Dias and G.S. Palazzo	919
Forming Approaches Comparison for High Customised Skull Manufacturing	
G. Ambrogio, R. Conte, L. de Napoli, G. Fragomeni and F. Gagliardi	925
Improving the Ramp-Up Process of a Body-Construction Line by Numerical Supported Design of Clamping Devices and FEM Based Tolerance Prognosis	
D. Landgrebe, P. Ackert, R. Grützner, J. Weber, R. Mauermann and A. Tegtmeier	932

Chapter 10: Small Scale Plasticity, Damage and Fracture

Surface Energies Arising in Microscopic Modeling of Martensitic Transformations in Shape-Memory Alloys	
G. Kitavtsev, S. Luckhaus and A. Rüland	941
Rate-Independent Deformation Patterning in Crystal Plasticity	
G. Lancioni, G. Zitti and T. Yalcinkaya	944
Determination of the Plastic Strain by Spherical Indentation of Uniaxially Deformed Sheet Metals	
M. Idriss, O. Bartier, G. Mauvoisin, C. Moussa, E. Gazo Hanna and X. Hernot	950
Comparison of Three Methods for Material Hardening Parameter Identification under Cyclic Tension-Compression Loadings: Roll Levelling Case Study	
E. Silvestre, E. Sáenz de Argandoña, L. Galdos and J. Mendiguren	957
Relaxation of the Non-Convex, Incremental Energy-Minimization Problem in Single-Slip Strain-Gradient Plasticity	
K. Anguige and P.W. Dondl	963
Finite Element Modeling of Deformation Behavior of Steel Specimens under Various Loading Scenarios	
D. Banerjee, M. Iadicola, A. Creuziger and T. Foecke	969
A Microstructure Based Model for the Mechanical Behavior of Multiphase Steels	
P.J.J. Kok, W. Spanjer and H. Vegter	975
Climb Enabled Discrete Dislocation Plasticity of Superalloys	
C. Ayas and V. Deshpande	981
Measuring Plasticity in Confined Cu Thin Films at Different Geometries	
Y. Mu and W.J. Meng	987
Physics Based Formulation of a Cohesive Zone Model for Ductile Fracture	
T. Yalcinkaya and A. Cocks	993

Chapter 11: Intelligent Computation in Forming Processes

Experimental and Computational Analysis of the Heating Step during Thermoforming of Thermoplastics	
B. Buffel, M. Amerijckx, M. Hamblok, B. van Mieghem, F. Desplentere and A. Van Bael	1003
Prediction of Crashworthiness for Extruded Magnesium Materials	
D. Steglich and X. Tian	1009
An Error-Adaptive, Non-Rigid Registration Method for the Analysis of Springback in Sheet Metal Forming	
M. Schweinöck, A. Sacharow, D. Biermann and C. Buchheim	1015

Chapter 12: Incremental and Sheet Metal Forming

The Effect of the Initial Stress and Strain State in Sheet Metals on the Roller Levelling Process	
M. Grüber, M. Oligschläger and G. Hirt	1023
Numerical Investigation of Dry and Lubricated Sheet Metal Forming Processes	
M. Merklein, E. Affronti and J. Steiner	1029
Effects of Thermal Parameters on the Mechanical Characteristics of Ti6Al4V Sheets Deformed at Elevated Temperatures	
B. Valoppi, S. Bruschi and A. Ghiotti	1036
Dry Rotary Swaging - Tube Forming	
M. Herrmann, B. Kuhfuss and C. Schenck	1042
Extension of Process Limitations in Swing Folding by the Integration of a Modular Heating Unit	
S. Husmann and D. Kreimeier	1048
Formability Evaluation of Grade 1 Titanium Sheets Depending on the Temperature by FE Analyses	
A. Formisano, A. Astarita, L. Boccarusso, F. Capece Minutolo, L. Carrino, M. Durante, A. Langella and A. Squillace	1054
Non-Linear Numerical Simulation of Coiling by Elastic Finite Strain Model	
D. Weisz-Patrault, A. Ehrlicher, N. Legrand and E. Mathey	1060
A New Method of Producing Bend Angle by Applying Sheet Forging to V-Bending Process	
T. Aso, T. Iizuka and T. Ota	1066
Multi-Stage Cold Deep Drawing of Pure Titanium Square Cup	
Y. Harada and M. Ueyama	1072
Multiobjective Optimization Problem of Dieless Incremental Forming	
H. Arfa, R. Bahloul and H. Belhadj Salah	1078
Robot Controlled Rotary Peen Forming by Laser-Assisted Distance Control	
M. Gottschalk, M. Bambach and G. Hirt	1084
Influence of a Single Bend in the Bumping Process of Large Radius Air Bending	
V. Vorkov, R. Aereus, D. Vandepitte and J.R. Dufloy	1090
Improving Accuracy in Aluminum Incremental Sheet Forming of Complex Geometries Using Iterative Learning Control	
A. Fiorentino, E. Ceretti, G.C. Feriti and C. Giardini	1096
Plasticity Criterion for Hot Forming of Aluminum-Lithium Alloy	
W. Younes, E. Giraud and P. dal Santo	1103
Friction-Spinning - Influence of Tool and Machine Parameters on the Surface Texture	
B. Lossen and W. Homberg	1109
Developing a Knowledge Base about the Technological Forces within the Asymmetric Incremental Forming Process	
M. Tera, R.E. Breaz, O. Bologa and S.G. Racz	1115
Challenges and Process Strategies Concerning Multi-Pass Double Sided Incremental Forming	
N. Moser, E. Ndip-Agbor, H.Q. Ren, Z.X. Zhang, K. Ehmann and J. Cao	1122
Feasibility of Motion-Capture Techniques Applied to Tube Bending	
E. Simonetto, A. Ghiotti and S. Bruschi	1128
Shape Factors and Feasibility of Sheet Metal Hydroformed Components	
T. Primo, G. Papadia and A. Del Prete	1134

Numerical – Experimental Correlation of Sheet Hydroformed Component A. Spagnolo, T. Primo, G. Papadia and A. Del Prete	1140
Predicting Tube Ovalization in Cold Bending: An Analytical Approach T. Welo and F. Paulsen	1146
Numerical and Experimental Investigations of Multistage Sheet-Bulk Metal Forming Process with Compound Press Tools B.A. Behrens, A. Bouguecha, M. Vucetic, S. Hübner, D. Rosenbusch and S. Koch	1153
Assessing 3 and 5 Degrees of Freedom Toolpath Strategy Influence on Single Point Incremental Forming J.B.S. de Farias, R.P. Bastos, J.A. Ferreira and R.J.A. de Sousa	1159

Chapter 13: Machining and Cutting

Uncertainty Management of Cutting Forces Parameters and its Effects on Machining Stability E. Rivière Lorphèvre, C. Letot, F. Ducobu and E. Filippi	1165
Study of an Industrial FEM Tool for Line Boring Process of Cylinder Blocks S. Tabibian and P. Lorong	1171
Machinability of the EBM Ti6Al4V in Cryogenic Turning S. Sartori, A. Bordin, S. Bruschi and A. Ghiotti	1183
Innovations in Descaling and Deburring M. Mortsch and A. Schmid	1189
Comparison of Several Behaviour Laws Intended to Produce a Realistic Ti6Al4V Chip by Finite Elements Modelling F. Ducobu, P.J. Arrazola, E. Rivière-Lorphèvre and E. Filippi	1197
Economical Comparison of Cryogenic vs. Traditional Turning of Ti-6Al-4V: A Case Study S. Tirelli, E. Chiappini, M. Strano, M. Monno and Q. Semeraro	1204
Cutting Process of Double Angle Drill S. Tamura and T. Matsumura	1211
Application of Optimal Control Problem for Surface Roughness Improvement in Milling K. Skrypka and P. Bosetti	1217
Dynamic Recrystallization Observed at the Tool/Chip Interface in Machining Y. Senecaut, M. Watremez, J. Brocail, L. Fouilland-Paillé and L. Dubar	1223
Tool Wear Prediction in Machining Process Using a Microstructure-Based Finite Element Model M. Sáez-de-Buruaga, I. Poveda and P.J. Arrazola	1229
Dynamic Recrystallization of Spheroidal Graphite Iron during Hot Cutting Operations K. Le Mercier, M. Watremez, L. Fouilland-Paillé and L. Dubar	1235
A Numerical Procedure for Machining Distortions Simulation on a SAF 2507 Casting Workpiece R. Franchi, A. Del Prete and G. Papadia	1241
The Use of FEA in the Simulation of a Metal Cutting Operations in the Presence of Random Uncertainty R. Franchi, A. Del Prete and T. Primo	1247
Numerical Modelling of Orthogonal Cutting of Electron Beam Melted Ti6Al4V A. Bordin, S. Imbrogno, S. Bruschi, A. Ghiotti and D. Umbrello	1255
Studies on the Effect of Tool Wear on the Production Process in Two Stage Shear Cutting T. Gläsner, T. Schaffner, C. Sunderkötter, W. Volk, H. Hoffmann and R. Golle	1261
Microstructure Induced Wear Mechanisms of PVD-Coated Carbide Tools during Dry Drilling of Newly Produced ADI A. Meena and M. El Mansori	1271

Chapter 14: New and Advanced Numerical Strategies for Material Forming

Virtual Process Design for Cold Formed Components S. Schratter, J. Keckes, G. Winter and B. Buchmayr	1279
--	------

Separated Representations of Incremental Elastoplastic Simulations M.A. Nasri, J.V. Aguado, A. Ammar, E. Cueto, F. Chinesta, F. Morel, C. Robert and S. Elareem	1285
Efficient Updated-Lagrangian Simulations in Forming Processes D. Canales, A. Leygue, F. Chinesta, E. Cueto, E. Feulvarch, J.M. Bergheau, Y. Vincent and F. Boitout	1294
Numerical Damage and Failure Modelling of Lightweight Alloys during Metal Forming Processes A.M. Horr	1301
Study of Formability of Sandwich Shells with Metal Foam Cores Based on Punch Penetration Test H. Mata, R. Natal Jorge, A.D. Santos, M.P.L. Parente, R.A.F. Valente and A.A. Fernandes	1307
Recent Developments in LS-DYNA to close the Virtual Process Chain for Forming, Press Hardening and Welding T. Klöppel, A. Erhart, A. Haufe and T. Loose	1312
Agile Multiscale Modelling of the Thermo-Mechanical Processing of an Aluminium Alloy P. Macioł, R. Bureau, C. Poletti, C. Sommitsch, P. Warczok and E. Kozeschnik	1319
Virtual Joining Factory – Integration of Microstructure Evolution in the Manufacturing Process Chain Simulation U. Beyer, I. Neubauer, J. Kreyca and E. Kozeschnik	1325
Simulation of Incremental Forming Processes Using a Thermo-Mechanical Partitioned Algorithm M. Khaled, M. Ramadan, A. Elmarakbi and L. Fourment	1331

Chapter 15: Optimization and Inverse Analysis in Forming

Identification Problem of Internal Variables Model of Material D. Szeliga, R. Kuziak and M. Pietrzyk	1339
Inverse Analysis Procedure to Determine Flow Stress and Friction Data for Metal Cutting Finite Element Modeling R. Franchi, A. del Prete, D. Umbrello and E. Mariano	1345
Using Data Sampling and Inverse Optimization for the Reduction of the Experimental Effort in the Characterization of Hot Working Behaviour for a Case Hardening Steel A. Kraemer, J. Lohmar, M. Bambach and G. Hirt	1351
Determination of Thermal Boundary Conditions for Modeling the Hot Roll Bonding Process A. Melzner and G. Hirt	1357
Inverse Identification of Process Variations for Thin Steel Sheet Bending J. Havinga and T. van den Boogaard	1363
Sensitivity Analysis for Numerical Sheet Metal Forming Processes A. Maia, M.C. Oliveira, A. Andrade-Campos and L.F. Menezes	1369
Intelligent Advisory System for Support of Production Process Design in the Domain of Metal Forming G. Rojek, K. Regulski, D. Szeliga and J. Kusiak	1375
Application of a Non-Invasive Form Finding Algorithm to the Ring Compression Test with Varying Friction Coefficients P. Landkammer and P. Steinmann	1381
Multi-Objective Optimization of Metal Forming Processes Based on the Kalai and Smorodinsky Solution L. Iorio, L. Fourment, S. Marie and M. Strano	1387
Multi-Objective Optimization of the Hydroforming Process Considering Different Plastic Yield Criteria V. Piglionico, A. Piccininni, G. Palumbo and L. Tricarico	1394
Multi-Objective Optimization under Uncertainty and Decision-Making Support for Sheet Metal Forming V.D. Nguyen, P.A. Adragna and P. Lafon	1400
Numerical Optimization of Current Parameters in Combined Electromagnetic-Classical Forming Processes Y. Kiliclar, M. Rozgić, S. Reese and M. Stierner	1406

Chapter 16: Innovative Joining by Forming Technologies

Numerical Modelling of Explosive Welding on the Basis of the Coupled Eulerian Lagrangian Approach	
L. Madej, K. Perzynski and H. Paul	1415
Investigation of Cold Pressure Welding: Cohesion Coefficient of Copper	
H.C. Schmidt, C. Ebbert, D. Rodman, W. Homberg, G. Grundmeier and H.J. Maier	1421
Study of the Metallurgy of a Dissimilar Ti-6Al-4V – Stainless Steel Linear Friction Welded Joints	
F. Impero, F. Scherillo, A. Astarita, K.A. Beamish, M. Curioni, A. Squillace and X.R. Zhou	1427
Friction Stir Lap Joining of Blanks under Different Conditions	
C. Bruni, A. D'Orazio and M. El Mehtedi	1433
Effect of Geometric Parameters in the Upsetting and Extruding Riveting Process on the Quality of Riveted Joints	
W.J. Li and L.F. Yang	1439
Basic Investigations on Joining of Metal and Fibre Components Based on the Semi-Solid Forming Process	
L. Marx, M. Liewald and K.R. Riedmüller	1445
Forming Behavior during Joining by Laser Induced Shock Waves	
S. Veenaas and F. Vollertsen	1451
Numerical Simulation of Spin-Blind-Riveting of Magnesium and Fibre-Reinforced Plastic Composite	
R. Kaboli, F. Podlesak and P. Mayr	1457
Adhesive Distribution and Global Deformation between Hybrid Joints	
D. Landgrebe, B. Mayer, S. Niese, H. Fricke, I. Neumann, M. Ahnert and T. Falk	1465
Thermo-Mechanical Characterization of Friction Stir Spot Welded Sheets: Experimental and FEM Comparison between AA6060 and AA7050 Alloys	
G. D'Urso and C. Giardini	1472
Experimental Comparison of the MIG and Friction Stir Welding Processes for AA 6005 Aluminium Alloy	
S. Caruso, D. Campanella, S. Candamano, C. Varrese, F. Crea, L. Filice and D. Umbrello	1480
FEA-Based Optimisation of a Clinching Process with a Closed Single-Part Die Aimed at Damage Minimization in CR240BH-AlSi10MnMg Joints	
B.A. Behrens, A. Bouguecha, M. Vucetic, S. Hübner, D. Yilkiran, Y.L. Jin and I. Peshekhodov	1487
Influence of Process Induced Damages on Joint Strength when Self-Pierce Riveting Carbon Fiber Reinforced Plastics with Aluminum	
D. Landgrebe, M. Jäckel and R. Niegsch	1493

Chapter 17: Heat Transfer Modelling

Research of Temperature Distribution during Friction Stir Welding of 2 mm AW 6082 Sheets	
	1501
Heat Transfer and Crystallization Modeling during Compression Molding of Thermoplastic Composite Parts	
J. Faraj, B. Pignon, J.L. Bailleul, N. Boyard, D. Delaunay and G. Orange	1507
Modelling of Laser Welding Process on Thermoplastic Composites	
B. Cosson	1513
Inverse Thermal Analysis of Melting Pool in Selective Laser Melting Process	
L. van Belle and A. Agazzi	1519
Detailed Heat Transfer Modelling & Optimization of a Forced-Convection Kiln Using CFD Methods	
H. Maier, W. Berger and R. Breyner	1525
Numerical Heat Treatment Modelling of Fine Blanked Sheet Metal and Experimental Validation	
M. Peterli, N. Manopulo and P. Hora	1531

Determination of Heat Transfer Coefficients for Different Initial Tool Temperatures and Closed Loop Controlled Constant Contact Pressures J. Mendiguren, R. Ortubay, X. Agirretxe, J.M. Martín, L. Galdos and E. Sáenz de Argandoña	1537
---	------

Chapter 18: Semi-Solid Processes

Simplified Rheocasting of Al-Si Alloys Sheared by Mechanical Stirring A. Hernández, J.F. Chávez and R.E. Hernández	1545
Semisolid Casting of Product with Thin Fins by Using Al-25%Si T. Haga and H. Fuse	1551
Fabrication of Ingot with Lotus Type Through-Holes in Semisolid Condition T. Haga and H. Fuse	1557
Experimental and Numerical Analysis of Residual Stress in Cast Aluminum Alloy after FSP Process M.S. Weglowski, P. Sedek and C. Hamilton	1563
Mechanical Properties of Thixoformed 7075 Feedstock Produced via the Direct Thermal Method A.H. Ahmad, S. Naher and D. Brabazon	1569

Chapter 19: Extrusion and Drawing

Comparison of the Thermo-Mechanical Conditions in an Industrial Sized Hot Aluminium Extrusion Process in Relation to those in Corresponding Small Sized Laboratory Processes H. Valberg, S. Torabzadeh Khorasani and D. Nolte	1577
Microstructural Characterization of Indirectly Extruded EN AW-6060 Square Tubes with Axial Variable Wall Thickness M. Negendank, U.A. Taparli, S. Müller and W. Reimers	1585

Chapter 20: Energy Efficient Solutions in Material Forming

The Impact of Torsion on the Bending Curve during 3D Bending of Thin-Walled Tubes - A Case Study on Forming Helices D. Staupendahl, C. Becker and A.E. Tekkaya	1595
Influencing the Forming Limits in Air Bending Using Incremental Stress Superposition S. Chatti, A. Weinrich, M. El Budamusi, C. Becker, F. Maevus and A.E. Tekkaya	1602
Influence of Layer Number on Mechanical Property of Steel Hollow Sphere Sheet Sandwich Construction Y. Yoshida and T. Noritake	1608
Wall Thickness Distribution during a Combined Tube Spinning and Bending Process C. Becker and A.E. Tekkaya	1614