

18th International Conference on Metal Forming 2020

Procedia Manufacturing Volume 50

Krakow, Poland
13 – 16 September 2020

Editors:

**Danuta Szeliga
Krzysztof Muszka**

ISBN: 978-1-7138-1788-8

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2020) The Authors. Published by Elsevier Ltd.
Creative Commons Attribution 4.0 International License.
License details: <http://creativecommons.org/licenses/by/4.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination, and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2021)

For permission requests, please contact the publisher:

Elsevier B.V.
Radarweg 29
Amsterdam 1043 NX
The Netherlands

Phone: +31 20 485 3911
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

<p>PREFACE</p> <p style="padding-left: 20px;"><i>Danuta Szeliga, Krzysztof Muszka</i></p> <p>INFLUENCE OF HEATING MODE ON ORANGE PEEL PATTERNS IN WARM INCREMENTAL FORMING OF MAGNESIUM ALLOY</p> <p style="padding-left: 20px;"><i>Juan Liao, Jianhua Liu, Lixia Zhang, Xin Xue</i></p> <p>ON THE MANUFACTURING OF HIGHLY-CUSTOMIZED NEAR NET-SHAPE MEDICAL IMPLANTS USING MAGNESIUM ALLOY SHEET.....</p> <p style="padding-left: 20px;"><i>Joan Castells, Pasquale Guiglielmi, Ines Ferrer, Gabriel Centeno, M. Luisa Garcia-Romeu</i></p> <p>A METHOD OF MANUFACTURING CAR MUFFLERS BY WRAPPING SHEETS, USING INNOVATIVE FORMING DEVICE WITH THE USE OF SERVO DRIVE.....</p> <p style="padding-left: 20px;"><i>Pawel Balon, Jacek Cieslik, Lukasz Halama, Bartlomiej Kielbasa, Edward Rejman</i></p> <p>EFFECT OF BLANKING ON MAGNETIC AND MECHANICAL PROPERTIES OF NON- ORIENTED ELECTRICAL STEEL.....</p> <p style="padding-left: 20px;"><i>Ronggao Cui, Shuhui Li, Ji He</i></p> <p>DEFORMATION BEHAVIOUR IN SHEARING OF ULTRA-HIGH STRENGTH STEEL SHEETS UNDER INSUFFICIENT BLANKHOLDING FORCE</p> <p style="padding-left: 20px;"><i>Ryo Yagita, Yohei Abe, Yuma Munesada, Ken-Ichiro Mori</i></p> <p>RESEARCH AND APPLICATION OF PRECISION FORGING FORMING PROCESS FOR FLAT THIN FLASH OF AUTOMOBILE DISC STEERING KNUCKLE</p> <p style="padding-left: 20px;"><i>Yunjun Zhang, Shijin Cao, Mingwei Huang, Yang Yan, Jie Yang</i></p> <p>FLEXIBLE 3D STRETCH BENDING OF ALUMINIUM ALLOY PROFILES: AN EXPERIMENTAL AND NUMERICAL STUDY</p> <p style="padding-left: 20px;"><i>Torgeir Welo, Jun Ma, Jørgen Blindheim, Taekwang Ha, Geir Ringen</i></p> <p>STUDY ON WARM FORMABILITY OF ALUMINUM ALLOY 2219 IN HEMISPHERICAL PART CONVENTIONAL SPINNING.....</p> <p style="padding-left: 20px;"><i>Tian Gan, Jun Ni, Zhongqi Yu, Yixi Zhao, Shuhui Li</i></p> <p>THE MICROSTRUCTURE EVOLUTION OF 6061 ALUMINUM ALLOY DURING DIELESS ROLLING THERMAL DEFORMATION</p> <p style="padding-left: 20px;"><i>Gang Yang, Jianqiang Hao, Huizhen Wang, Peixin Liang, Junpin Lin</i></p> <p>A STUDY ON THE HOT ROLL BONDING OF ALUMINUM ALLOYS.....</p> <p style="padding-left: 20px;"><i>Tan Zinong, Zhao Bing, Jiang Jun, Li Zhiqiang, Lin Jianguo</i></p> <p>HOT DEFORMATION BEHAVIOR OF TI-AL-SN-ZR-MO ALLOY</p> <p style="padding-left: 20px;"><i>Oleksandr Lypchanskyi, Tomasz Sleboda, Krystian Zygula, Marek Wojtaszek, Maciej Ruminski</i></p> <p>PREDICTING THE ECCENTRICITY OF TUBES BY DEVELOPING A MULTIPLE REGRESSION MODEL IN TUBE DRAWING PROCESS WITH TILTED DIE</p> <p style="padding-left: 20px;"><i>Fariba Heidarian, Heinz Palkowski</i></p> <p>RESEARCH ON TORSION DEFORMATION OF INTEGRAL STIFFENED PANEL BY PRE- STRESS SHOT PEEN FORMING</p> <p style="padding-left: 20px;"><i>Mingtao Wang, Yuansong Zeng, Xuepiao Bai, Fenggong Lyu</i></p>	<p>1</p> <p>5</p> <p>11</p> <p>17</p> <p>22</p> <p>26</p> <p>32</p> <p>37</p> <p>45</p> <p>51</p> <p>56</p> <p>63</p> <p>69</p> <p>74</p>
--	---

NUMERICAL AND EXPERIMENTAL EVALUATION OF AN ALTERNATIVE MECHANISM FOR WALL THICKNESS VARIATIONS OF HOLLOW PROFILES APPLYING A PORTHOLE DIE	79
<i>Maik Negendank, Vidal Sanabria, Walter Reimers, Soeren Mueller</i>	
2D THERMAL FINITE ELEMENT ANALYSIS OF LASER CLADDING OF 316L+WC COMPOSITE COATINGS	86
<i>Seifallah Fetni, Tommaso Maurizi Enrici, Tobia Niccolini, Son Hoang Tran, Anne Marie Habraken</i>	
FRICITION STIR WELDING OF Ti6AL4V COMPLEX GEOMETRIES FOR AERONAUTICAL APPLICATIONS: A FEASIBILITY STUDY	93
<i>Davide Campanella, Gianluca Buffa, Antonio Barcellona, Livan Fratini</i>	
PSEUDO LINEAR JOINING FOR DISSIMILAR MATERIALS UTILIZING PUNCHING AND FRICTION STIR FORMING.....	98
<i>Takahiro Ohashi, Taiki Ohno, Hamed Mofidi Tabatabaei, Tadashi Nishihara</i>	
INVESTIGATION OF MATERIAL PROPERTIES OF TAILORED PRESS HARDENING PARTS USING NUMERICAL AND PHYSICAL SIMULATION	104
<i>Maria Emanuela Palmieri, Vincenzo Domenico Lorusso, Luigi Tricarico</i>	
THE NUMERICAL ANALYSIS OF THE MAGNETORHEOLOGICAL ELASTOMER BULGING FOR SHEET METAL	110
<i>Rui Zhang, Chao Yin, Xiao Luo, Zhong-Jin Wang</i>	
IRONING LIMIT OF ALUMINIUM ALLOY CUPS WITH LUBRICANTS CONTAINING NANOPARTICLES AND TOOL STEEL DIE	114
<i>Yohei Abe, Kai Sugiura, Ken-Ichiro Mori</i>	
EFFECTS OF DIFFERENT DEFORMATION ROUTES OF ECAP ON AA6063 MECHANICAL PROPERTIES AND MICROSTRUCTURE.....	119
<i>Jianye Gao, Tao He, Yuanming Huo, Tingting Yao, Haoyang Hong</i>	
DEVELOPMENT OF NOVEL DIFFERENTIAL VELOCITY SIDEWAY EXTRUSION TECHNIQUES TO FABRICATE LIGHTWEIGHT CURVED STRUCTURAL COMPONENTS.....	125
<i>Junquan Yu, Jianguo Lin, Trevor A. Dean</i>	
DEFORMATION CHARACTERISTICS ANALYSIS OF THE FINEBLANKING-EXTRUSION FLANGING PROCESS	129
<i>Yanxiong Liu, Yuwen Shu, Han Chen, Zuowei Zhang</i>	
AN EXPERIMENT STUDY ON A NOVEL CONSTRUCTIVE HOT RING ROLLING PROCESS.....	134
<i>Deng Jiadong, Liu Jikang, Cheng Zhe, Qian Dongsheng, Fei Yin</i>	
ROLL-DRAWING OF CUP WITH THICK WALL	139
<i>Baohong Zhang, Chunyu Wei, Bin Hu, Xi Zhao</i>	
INVESTIGATION ON THE HOLE EVOLUTION AND FORMING DIMENSIONS DURING CROSS WEDGE ROLLING HOLLOW SHAFT WITH MANDREL.....	143
<i>Jinxia Shen, Baoyu Wang, Longfei Lin, Junlin Li, Chuanbao Zhu</i>	
INTERFACIAL EVOLUTION AND MECHANICAL PROPERTY OF AZ31BMG/5052AL CLAD PLATE MANUFACTURED BY CORRUGATED + FLAT ROLLING TECHNIQUE.....	148
<i>Sha Li, Jianchao Han, Tao Wang, Yuanming Liu, Jianglin Liu</i>	

ANALYSIS OF THE DEEP DRAWING PROCESS OF THREE-LAYERED EXPLOSIVE WELDED COMPOSITE.....	153
<i>Kwiecien Marcin, Lisiecki Lukasz, Lisiecka-Graca Paulina, Muszka Krzysztof, Majta Janusz</i>	
EFFECT OF PROCESS PARAMETERS ON LONGITUDINAL WELD SEAM QUALITY OF ALUMINUM ALLOY PROFILE FOR AN AUTOMOBILE FUEL TANK PROTECTOR	159
<i>Wenlin Chen, Chen Xu, Penglin Pan, Xiangming Ruan, Hongxuan Ji</i>	
NUMERICAL MODELLING OF THE MULTI-STAGE PRODUCTION PROCESS OF LARGE-SIZE RINGS ROLLING FOR THE SHIPBUILDING INDUSTRY INCLUDING ANALYSIS OF INTERNAL DISCONTINUITIES	168
<i>Lukasz Lisiecki, Aneta Lukaszek-Solek, Józef Kowalski, Janusz Majta, Slawomir Misiowiec</i>	
ROLL PASS DESIGN, NUMERICAL MODEL AND PROCESSING PROCEDURE OF A 3RD GENERATION DUAL PHASE SHEET STEEL	173
<i>Taher El-Bitar, Maha El-Meligy, Mahmoud Khedr</i>	
FEASIBILITY STUDY ON THINNING AND THICKENING OF THIN-WALLED PIPE FITTINGS IN THREE-ROLL SKEW ROLLING	179
<i>Yingxiang Xia, Xuedao Shu, Song Zhang, Zixuan Li, Jaroslaw Bartnicki</i>	
SIMULATION AND EXPERIMENT OF REDUCTION OF EQUAL-DIAMETER HOLLOW SHAFTS WITH THREE-ROLL SKEW ROLLING.....	183
<i>Song Zhang, Xuedao Shu, Chang Xu, Jitai Wang, Yingxiang Xia</i>	
STUDY ON GEOMETRIC PARAMETERS AFFECTING LONGITUDINAL BENDING PERFORMANCE FOR U-CHANNEL OF TAILOR ROLLED BLANK.....	187
<i>Hua-Wei Zhang, Jia-Lu Wu</i>	
INVESTIGATION OF COMPACTION BY RING ROLLING ON THERMAL SPRAYED COATINGS.....	192
<i>Bernd Kuhlentkötter, Thomas Glaser, Simon Fahle, Simon Husmann, Wolfgang Tillmann</i>	
STUDY OF ULTRASONIC VIBRATION-ASSISTED FORMING IN COPPER CYLINDER COMPRESSION	199
<i>Tianfeng Zhou, Chunfeng Ma</i>	
IMPROVEMENT OF BURNISHED AREA IN PUNCHING OF STAINLESS STEEL THICK PLATE BY MEANS OF PULSATING MOTION	203
<i>Tomoyoshi Maeno, Minoru Sugawara, Takumi Saito, Ayato Terada, Ken-Ichiro Mori</i>	
EFFECTS OF ROCKING DIRECTION ON LOAD AND FORGED GEOMETRY IN CYLINDER UPSETTING	210
<i>Kenji Hirota, Shota Yoshimi, Yuto Yoshida</i>	
COLD UPSETTING WITH ROCKING MOTION USING MULTIPLE LINEAR ACTUATORS	215
<i>Kenji Hirota, Yuto Yoshida, Shota Yoshimi</i>	
INVESTIGATION OF THERMAL EFFECTS DURING ULTRASONIC-ASSISTED UPSETTING	220
<i>Manuel Jäckisch, Marion Merklein</i>	
INVESTIGATION OF MATERIAL FLOW BEHAVIOUR AND MICROSTRUCTURE DURING DIFFERENTIAL VELOCITY SIDEWAY EXTRUSION	226
<i>Xiao Chen Lu, Junquan Yu, Jianguo Lin, Zhusheng Shi</i>	

AUTOMATIC RE-LUBRICATION BY PULSATING MOTION WITH PUNCH HAVING DIMPLE BOTTOM IN BACKWARD EXTRUSION OF CYLINDRICAL CUP.....	231
<i>Tomoyoshi Maeno, Hiroki Homma, Ryohei Ikeda, Ken-Ichiro Mori</i>	
HOLE-FLANGING OF AA7075-O SHEETS: CONVENTIONAL PROCESS VERSUS SPIF	236
<i>Marcos Borrego, Domingo Morales-Palma, José Andrés López-Fernández, Andrés J. Martínez-Donaire, Carpóforo Vallengano</i>	
INVESTIGATION OF ANISOTROPIC CREEP-AGEING BEHAVIOUR OF AL-CU-LI ALLOY AA2050	241
<i>Chenpeng Tong, Yong Li, Zhusheng Shi</i>	
STUDY ON EFFECTS OF STRONG SHEAR STRAIN ON RECRYSTALLIZED GRAIN SIZE OF PURE IRON AND MICROSTRUCTURE CONTROL METHOD	248
<i>Fumihisa Nagashima, Yuki Nakagawa, Masahiko Yoshino</i>	
EFFECT OF TRANSVERSE RIBS ON AXIAL DISPLACEMENT OF REBARS IN BENDING	253
<i>Satoshi Higaki, Hibiki Nishida, Yuta Koike, Masahiro Sasada, Tatsuya Tanaka</i>	
CONTROLLING MATERIAL FLOW IN INCREMENTAL SHEET-BULK METAL FORMING BY THERMAL GRADING.....	257
<i>Sebastian Wernicke, Ulrich Thier, Marlon Hahn, Erman Tekkaya</i>	
PROGRESS ON RAPID HOT GAS FORMING OF TITANIUM ALLOYS: MECHANISM, MODELLING, INNOVATIONS AND APPLICATIONS	265
<i>Gang Liu, Kexin Dang, Kehuan Wang, Jie Zhao</i>	
DRAWING OF MAGNESIUM FINE WIRE AND MEDICAL APPLICATION OF DRAWN WIRE.....	271
<i>Natthiwan Dodyim, Kazunari Yoshida, Tomoaki Murata, Yusuke Kobayashi</i>	
PREFORM OPTIMIZATION OF A BRAKE DRUM PART BASED ON QUASI-EQUIPOTENTIAL FIELD AND RESPONSE SURFACE METHODS.....	276
<i>H U Chen, Yanjin Guan, Mujuan Liu, Y I Li, Jun Lin</i>	
PROCESS DESIGN FOR THE FORMING OF SEMI-TUBULAR SELF-PIERCING RIVETS MADE OF HIGH NITROGEN STEEL	280
<i>Clara-Maria Kuball, Benedikt Uhe, Gerson Meschut, Marion Merklein</i>	
PRODUCTION MECHANISM OF RESIDUAL STRESS IN SPINNING OF THIN WALL CONE PARTS WITH VARIABLE SECTION	286
<i>Xuedao Shu, Ying Chang, Ying Zhu, Bohai Ye, Zixuan Li</i>	
RELATION BETWEEN MICROSTRUCTURE AND MECHANICAL PROPERTIES ON INTERCRITICALLY DEFORMED LOW CARBON STEELS	291
<i>U. Mayo, N. Isasti, J. M. Rodriguez-Ibabe, P. Uranga</i>	
HOT STAMPING OF NON-RECTANGULAR STEEL SHEETS USING RESISTANCE HEATING BY LOCAL PREHEATING.....	298
<i>Yuki Nakagawa, Ken-Ichiro Mori, Michiya Nishikata</i>	
INFLUENCES OF KEY PROCESS PARAMETERS ON ORBITAL FORGING OF THIN-WALLED SMARTPHONE SHELL FRAME OF ALUMINUM ALLOY	303
<i>Binting Gu, Wuhao Zhuang, Xinghui Han</i>	

ANALYSIS OF THE STRESS STATE IN NON-AXIALLY SYMMETRICAL COLD FORGING DIES	307
<i>Martin Killmann, Marion Merklein</i>	
RESEARCH ON FORGING PROCESS FOR 42CRMO DUAL-GROUSER TRACK SHOE USED IN SPECIAL VEHICLE	314
<i>Zhiming Du, Yushi Qi, Changshun Wang, Yonggen Sun, Heng Wang</i>	
INFLUENCE OF DIFFERENT HEATING METHODS ON SPRINGBACK OF MILD STEEL PLATE DURING DIELESS BENDING PROCESS	318
<i>Bo Wei, Yanan Wei, Feifei Zhang, Kai He, Ruxu Du</i>	
EXPERIMENTAL INVESTIGATION ON ELECTRO-HYDRAULIC FORMING WITH FLEXIBLE-DIE	324
<i>Feifei Zhang, Yanan Wei, Kai He, Zhiqiang Hang</i>	
DEFORMATION BEHAVIOUR OF METAL MICRO TUBE DURING HYDROFORMING PROCESS.....	328
<i>Zicheng Zhang, Yajun Kang, Tsuyoshi Furushima, Ken-Ichi Manabe, Bin Li</i>	
RESEARCH ON THE HYDROFORMING REGULARITY AND PROCESS OPTIMIZATION CONTROL OF COMPLEX ALUMINUM ALLOY PART WITH VARIABLE CROSS-SECTION SIZE	332
<i>Qinglei Guo, Lihui Lang, Kui Li, Peicheng Jiang, Li Zhang</i>	
MANUFACTURING THIN-WALLED 99.99% PURE ZN TUBES WITH ULTRAFINE GRAINED STRUCTURES BY FLOWFORMING.....	337
<i>Magro Tommaso, Ghiotti Andrea, Bruschi Stefania</i>	
FORMING OF PIN ON THICK PLATE BY OPEN EXTRUSION.....	345
<i>Kazuhito Asai, Kazuhiko Kitamura</i>	
STUDY OF THE EFFECT OF ACCUMULATIVE ANGULAR DRAWING DEFORMATION ROUTE ON GRAIN REFINEMENT IN 304L STAINLESS STEEL.....	350
<i>Maciej Szymula, Krzysztof Muszka, Janusz Majta, Marek Packo, Jerzy Dybich</i>	
EFFECT OF BALL MILLING SPEED AND SINTERING TEMPERATURE ON MICROSTRUCTURE AND PROPERTIES OF TIAL ALLOY PREPARED BY POWDER METALLURGY	355
<i>Gong Siheng, Dong Xianjuan, Xiao Xuan, Xu Yong</i>	
DYNAMIC RECRYSTALLIZATION CONTROL IN HOT ROLLING.....	362
<i>Evgueni I. Poliak</i>	
MODEL FRAMEWORK FOR THE SIMULATION OF MICROSTRUCTURE AND YIELD STRESS DURING AGING OF INDUSTRIAL AL-MG-SI ALUMINUM ALLOYS	368
<i>Fabrice Wagner, Christian Bollmann, Thiemo Brüggemann, Stephan Hojda, Gerhard Hirt</i>	
2D THERMAL FINITE ELEMENT ANALYSIS OF STICKER BREAKOUT IN CONTINUOUS CASTING.....	376
<i>Hoang-Son Tran, Etienne Castiaux, Anne-Marie Habraken</i>	
VERIFICATION OF IDENTIFIED SYSTEM CIRCUIT PARAMETERS IN ELECTROMAGNETIC PULSE SYSTEM WITH HELIX COIL ACTUATORS	384
<i>Hyeonil Park, Jinwoo Lee, Youngseon Lee, Daeyong Kim</i>	

EXPERIMENTAL AND NUMERICAL INVESTIGATION OF PEEL TEST SPECIMEN USING BI-INJECTION MOLDING PROCESS	389
<i>Thierry Barrière, Mohamed Sahli, Xavier Roizard</i>	
MODELLING AND NUMERICAL SIMULATION OF STEEL SHEET FINE BLANKING PROCESS.....	395
<i>Mohamed Sahli, Xavier Roizard, Guillaume Colas, Mohamed Assoul, J. P. Barbe</i>	
STUDY OF POWDER DENSIFICATION UNDER HYDROSTATIC LOADS AT HIGH TEMPERATURES USING FINITE ELEMENT METHOD.....	401
<i>Borja Elguezabal, Jon Alkorta, José M. Martínez-Esnaola, Rafael Soler, Estíbaliz Paños</i>	
SIMULATION OF TWO HOLLOW SINKING PASSES IN ONE TOOL.....	407
<i>Peter Bella, Michal Kan, Martin Ridzon, Milan Mojzis</i>	
MODELLING THE FORMING ZONE OF FORCE FITTED BENDING PROCESSES	411
<i>Peter Frohn-Sörensen, Linda Borchmann, Bernd Engel</i>	
THE EFFECT OF INTERNAL CONTACT PRESSURE ON THERMAL CONTACT CONDUCTANCE DURING COIL COOLING	418
<i>Joonas Ilmola, Arne Pohjonen, Oskari Seppälä, Jari Larkiola</i>	
MATERIAL FLOW CHARACTERISTICS AND DEFORMATION LAW DURING DUAL DIRECTIONAL HOT FORGING OF THE STEEL-ALUMINIUM SPUR GEAR	425
<i>Wei Feng, Xiangyang Jia, Biao Liu, Ming Gao</i>	
NUMERICAL SIMULATION OF WRINKLING BEHAVIOR FOR THE TIN PLATE.....	429
<i>Jianjin Chen, Weijie Yuan, Wenhao Wu, Cheng Yang</i>	
QUALITY PREDICTION OF LONGITUDINAL SEAM WELDS IN ALUMINIUM PROFILE EXTRUSION BASED ON SIMULATION.....	433
<i>Ivan Kniazkin, Andrey Vlasov</i>	
PREPARATION OF CHEMICALLY ETCHED SURFACE TEXTURE AND ITS FRICTION CHARACTERISTICS IN SHEET FORMING.....	439
<i>Qi Zhang, Tangjie Mei, Dongliang Zhang, Miao Cao, Bin Han</i>	
REINFORCEMENT LEARNING IN FREE-FORM STAMPING OF SHEET-METALS	444
<i>Shiming Liu, Zhusheng Shi, Jianguo Lin, Zhiqiang Li</i>	
NUMERICAL INVESTIGATION IN OPTIMIZATION DESIGN FOR 1/16 VACUUM VESSEL SECTOR MULTIPLE BOTTOM SUPPORTS.....	450
<i>Hua Zhai, Yunlu Zhang, Jiacheng Yao, Zhihong Liu, Jiefeng Wu</i>	
CALIBRATION OF THERMAL CONTACT CONDUCTANCE FOR PRECISION FORMING	459
<i>Yakun Xu, Fengchun Yang, Xincun Zhuang, Zhen Zhao</i>	
A NEW ASYMPTOTIC CRACK TIP MODEL TO PREDICT FAILURE PROCESSES	464
<i>Edison A. Bonifaz</i>	
INNOVATIVE ALUMINIUM EXTRUSION: INCREASED PRODUCTIVITY THROUGH SIMULATION	469
<i>Alexander Medvedev, Alessandro Bevacqua, Andrey Molotnikov, Richard Axe, Rimma Lapovok</i>	

KNOWLEDGE-BASED DESIGN METHOD OF FORGING DIES BASED ON THE STEREOTYPES OF DIE STRUCTURES AND THE FUNCTIONS OF FORMING SURFACES.....	475
<i>Kazuya Matsunaga, Masanobu Umeda, Yuji Mure, Keiichi Katamine</i>	
NUMERICAL SIMULATION AND PROCESS OPTIMIZATION FOR HOT STRETCH BENDING OF TI-6.5AL-2ZR-1MO-1V LARGE-SECTION EXTRUSION.....	483
<i>Chen Zhang, Dongsheng Li, Xiaoqiang Li, Qin Xia</i>	
DETERMINATION OF EFFECTIVE HEAT TRANSFER COEFFICIENT FOR WATER SPRAY COOLING OF STEEL.....	488
<i>Sampo Uusikallio, Sami Koskenniska, Joonas Ilmola, Jussi Paavola, Jukka Kömi</i>	
FE SIMULATION OF THE RESIDUAL STRESS REDUCTION IN INDUSTRIAL-SIZED T-SECTION COMPONENT DURING A NEWLY PROPOSED MANUFACTURING PROCESS	492
<i>Jing-Hua Zheng, Ran Pan, Jianguo Lin, Catrin M. Davies</i>	
DETERMINATION OF TRANSFORMATION PLASTICITY COEFFICIENT OF STEEL BY HORIZONTAL QUENCHING OF SHAFT	498
<i>Keisuke Watanabe, Mayu Yamada, Morihiko Nakasaki, Ryo Matsumoto, Hiroshi Utsunomiya</i>	
SIMULATIVE BASIC INVESTIGATION FOR A NEW FORMING PROCESS PUNCH-HOLE-ROLLING	503
<i>Maximilian Knoll, Fabian Mühl, Peter Groche, Volker Schulze</i>	
COLD BULGING PROCESS FOR ALUMINIUM ALLOY RING WITH IRREGULAR SECTION	510
<i>Jian Lan, Hui Wei, Lin Hua</i>	
INFLUENCE OF MICROSTRUCTURE ON INHOMOGENEITY OF STRESS AND STRAIN IN THE DEFORMATION ZONE DURING ASYMMETRIC COLD ROLLING OF FERRITIC-PEARLITIC STEELS	514
<i>Dmitrii Konstantinov, Denis Pustovoitov, Alexander Pesin</i>	
DETERMINATION OF THE FLOW CURVE BASED ON THE TORSION OF CONICAL SPECIMEN	520
<i>Pavel Petrov, Dmitry Shishkin, Yuliy Kalpin, Igor Burlakov, Denis Kapitanenko</i>	
CHARACTERIZATION OF PLASTICITY AND FRACTURE OF AN QP1180 STEEL SHEET.....	529
<i>Chong Zhang, Yue Wang, Zhe Chen, Ning Yang, Qi Zhang</i>	
INVESTIGATION OF THE DYNAMIC PLASTIC HARDENING OF METAL THIN-WALLED TUBE UNDER LIQUID IMPACT FORMING.....	535
<i>Guolin Hu, Chunrong Pan, Zheng Liu</i>	
PREDICTION OF THE STRAIN HARDENING OF TRIP/TWIP STEELS CONSIDERING C CONTENTS	541
<i>Wenjiao Dan, Weigang Zhang, Tingting Huang</i>	
THE ANALYSIS OF HOT DEFORMATION BEHAVIOR OF POWDER METALLURGY TI-10V-2FE-3AL ALLOY USING ACTIVATION ENERGY AND ZENER-HOLLOMON PARAMETER.....	546
<i>Krystian Zygula, Marek Wojtaszek, Tomasz Sleboda, Oleksandr Lypchanskyi, Ulrich Prah</i>	
ANALYSIS OF DEFORMATION MECHANISM IN CORRUGATED ROLLING OF COMPOSITE PLATE.....	552
<i>Wenli Liu, Yuanming Liu, Tao Wang, Zhenhua Wang, Pingju Hao</i>	

INHOMOGENEOUS DEFORMATION OF CONSTITUENT PHASES IN TITANIUM ALLOYS UNDER TENSILE DEFORMATION	558
<i>Ji Zhe, Wang Cong, Guo Tao</i>	
AN EXPERIMENTAL AND THEORETICAL STUDY ON CONSTITUTIVE MODEL OF AL-2024T4 FOR SHEET METAL INCREMENTAL FORMING	565
<i>Chen Ke, Wang Yongjun, Wang Junbiao</i>	
ANALYZING THE PROPERTIES PROMOTING SHEAR BANDS AND DAMAGE INITIATION IN 3-POINT BENDING OF ULTRA-HIGH STRENGTH STEEL	570
<i>Robert Dowding, Christophe Pinna, Hassan Ghadbeigi, Didier Farrugia</i>	
STRETCH-BENDING CRACK SIMULATION FOR ADVANCED HIGH-STRENGTH THICK STEEL SHEETS CONSIDERING THE CONTACT PRESSURE EFFECT	574
<i>Gihyun Bae, Namsu Park, Junghan Song, Jongsup Lee, Kyoungsuk Oh</i>	
FEM SIMULATION OF FABRICATION OF AL-STEEL LAYERED COMPOSITES WITH MECHANICAL BONDING THROUGH THE INTERFACIAL CONCAVO-CONVEX LOCK EFFECT	579
<i>Alexander Pesin, Denis Pustovoitov, Olesya Biryukova, Natalia Ilyina</i>	
A STUDY ON RATIO AND LINEARITY OF STRAIN PATH IN IN-PLANE BIAxIAL TENSILE TEST FOR FORMABILITY EVALUATION.....	584
<i>Ruiqiang Zhang, Zhutao Shao, Zhusheng Shi, Jianguo Lin</i>	
IN SITU DETECTION AND CONTROL OF WRINKLE FORMATION DURING ROTARY DRAW BENDING.....	589
<i>Linda Borchmann, Peter Frohn-Sørensen, Bernd Engel</i>	
DAMAGE EVOLUTION IN THE PROCESS OF PLANE STRAIN BENDING UNDER TENSION AT LARGE STRAINS.....	597
<i>Sergei Alexandrov, Elena Lyamina</i>	
AN INVESTIGATION OF DAMAGE HEALING IN HIGH TEMPERATURE COMPRESSIVE FORMING PROCESS	602
<i>Wenbin Zhou, Shireen Afshan, Jianguo Lin</i>	
INVESTIGATION ON INFLUENCE OF MANDREL SHAPE ON SHEAR STRESS IN PURE SHEARING TEST OF THIN-WALLED ALUMINUM ALLOY TUBES	609
<i>Xiaosong Wang, Shuning Zhang, Mengchun Fu, Weilong Hu, Gang Liu</i>	
SURFACE ROUGHNESS IMPROVEMENT OF THE BENT THIN-WALLED COPPER TUBE BY CONTROLLING THE MICROSTRUCTURE AND TEXTURE COMPONENTS.....	613
<i>Songwei Wang, Shihong Zhang, Hongwu Song, Yan Chen</i>	
INVESTIGATION ON FORMING LIMIT OF CARBON NANOTUBE REINFORCED ALUMINUM MATRIX COMPOSITE SHEET AT HIGH TEMPERATURE.....	618
<i>Baosheng Liu, Fengchao Cao, Yuansong Zeng, Wei Wu, Dingrui Ni</i>	
NON-LINEAR FINITE ELEMENT INVESTIGATION OF FORMABILITY LIMIT BY BUCKLING IN CREEP AGE FORMING OF STIFFENED PANELS	625
<i>Wenbin Zhou, Qi Rong, Zhusheng Shi, Yuansong Zeng</i>	
PRELIMINARY MODELLING OF FORMING FORCES IN THREE DIRECTIONS FOR INCREMENTAL SHEET FORMING PROCESS BASED ON THE CONTACT AREA.....	630
<i>Fuyuan Liu, Yanle Li, Zinan Cheng, Zijian Wang, Jianfeng Li</i>	

HOT COMPRESSION DEFORMATION BEHAVIOR OF EXTRUDED ZK61M MAGNESIUM ALLOY AND ESTABLISHMENT OF CONSTITUTIVE EQUATION	637
<i>Xianglong Chen, Chunguo Xu, Hong Jin, Sixiao Qin</i>	
MECHANICAL BEHAVIOR AND MICROSTRUCTURE EVOLUTION OF TC4 ALLOY DURING HIGH TEMPERATURE PLASTIC DEFORMATION.....	642
<i>Yujia Hu, Yuanming Huo, Tao He</i>	
IN SITU OBSERVATION OF DEFORMATION BEHAVIOR OF TI6AL4V SUBJECTED TO ELECTRICALLY-ASSISTED FORMING PROCESS	647
<i>Xia'Nan Li, Zhutian Xu, Jihui Huang, Linfa Peng, Xinmin Lai</i>	
EFFECT OF MULTI-PASS HOT DEFORMATION ON FLOW STRESS AND MICROSTRUCTURE OF TI-6AL-4V TITANIUM ALLOY PREPARED BY HOT ISOSTATIC PRESSING	652
<i>Liu Haijun, Xue Yong, Zhang Zhimin, Ren Luying, Yan Jiangpeng</i>	
STUDY OF THE DYNAMIC RECRYSTALLIZATION OF INCONEL 625 ALLOYS THROUGH COGGING	658
<i>Ludovic Freund, Laurent Langlois, Régis Bigot, Olivier Gyss</i>	
EFFECT OF DEFORMATION ROUTES ON MICROSTRUCTURE OF AA6063 DURING EQUAL CHANNEL ANGULAR PRESSING	663
<i>Tingtng Yao, Tao He, Yuanming Huo, Jianye Gao, Haoyang Hong</i>	
LOW SPEED IMPACT PROPERTIES OF 5052 ALUMINUM ALLOY PLATE	668
<i>Zhichao Huang, Wei Wang, Yongchao Zhang, Jiamei Lai</i>	
EVALUATION OF THE EFFECT OF RAM SPEED FOR EXTRUSION OF AL6063 BASED ON ALE-BASED FINITE ELEMENT ANALYSIS OF L-SHAPED SAMPLE	673
<i>Namsu Park, Yeonghwan Song, Gihyun Bae, Sunho Jung, Hyunmin Sung</i>	
ASSESSMENT OF UTILIZATION OF AB-INITIO AND CALPHAD CALCULATIONS FOR A DESIGN OF HIGH-ENTROPY ALLOY FOR METAL FORMING.....	677
<i>Chrzan Konrad, Cichocki Kamil, Adamczyk Piotr, Drozd Pawel, Muszka Krzysztof</i>	
A STUDY ON GRAIN GROWTH USING A NOVEL GRAIN SIZE CALCULATION TOOL.....	684
<i>Sami Koskenniska, Oskari Seppälä, Jukka Kömi</i>	
GRADIENT MICROSTRUCTURE IN THE BONDING ZONE OF EXPLOSIVELY WELDED SHEETS	689
<i>Henryk Paul, Robert Chulist, Magdalena M. Mischczyk, M. Prazmowski</i>	
CHARACTERIZATION OF KINEMATIC HARDENING WITH A HYDRAULIC BULGE TEST.....	696
<i>Matthias Lenzen, Harald Schmid, Marion Merklein</i>	
NEW TECHNOLOGICAL POSSIBILITIES OF PRODUCING DIE INSERTS FOR HOT WORK.....	702
<i>Jan Senatorski, Jan Tacikowski, Pawel Maczynski</i>	
EXPERIMENTAL INVESTIGATIONS ON THE INTERACTIONS BETWEEN THE PROCESS PARAMETERS OF HOT FORMING AND THE RESULTING RESIDUAL STRESSES IN THE COMPONENT	706
<i>Bernd-Arno Behrens, Kai Brunotte, Hendrik Wester, Christoph Kock</i>	
THE EFFECT OF HEAT TREATMENT ON α / β PHASES EVOLUTION OF TC4 TITANIUM ALLOY FABRICATED BY SPARK PLASMA SINTERING	713
<i>Kaihua Xu, Yong Xue, Zhimin Zhang, Qiang Wang, Jishi Zhang</i>	

EFFECT OF THERMOHYDROGEN TREATMENT ON MICROSTRUCTURAL EVOLUTION AND PROPERTIES OF TA15 ALLOY	719
<i>Peixin Liang, Weidong Zhu, Guihua Liu, Gang Yang, Wei Wei</i>	
MATERIAL SELECTION IN HOT SHAPING MOLDS OF TITANIUM ALLOYS	723
<i>Aysegul Akdogan Eker, Ali Avci, Hakan Aydin, Cahit Sertac Aydogan, Emre Erol</i>	
INVESTIGATION ON SUPERPLASTIC DEFORMATION BEHAVIOR AND MICROSTRUCTURE EVOLUTION OF TNW700 TITANIUM ALLOY	729
<i>Lixia Ma, Min Wan, Weidong Li, Jie Shao, Xuepiao Bai</i>	
DEVELOPMENT AND PERFORMANCE OF HEAT INSULATION COATINGS FOR HOT ROLLING OF TITANIUM ALLOY AND SUPERALLOY RINGS	735
<i>Chi Feng, Su-Jie Duan</i>	
FRACTURE MODELLING OF MAGNESIUM SHEET ALLOY AZ31 FOR DEEP DRAWING PROCESSES AT ELEVATED TEMPERATURES	739
<i>Bernd-Arno Behrens, Hendrik Wester, Matthäus Dykiert</i>	
ON THE LOWER LIMIT OF MISORIENTATION OF GRAIN BOUNDARIES IN HOT FORGING OF AA7050	744
<i>Bin Gu, Shuai Jiang, Zhusheng Shi, Jianguo Lin</i>	
CHARACTERIZATION, MODELING AND MICROSTRUCTURE OF COMPOSITE ALUMINIUM ALLOY SPECIMENS AFTER ECAP	749
<i>Carlo Bruni, Daniele Ciccarelli</i>	
PRODUCTION OF ZINC WIRE FOR USE AS A HIGH STRENGTH BIODEGRADABLE SURGICAL THREADS.....	757
<i>Andrij Milenin, Piotr Kustra, Dorota Byrska-Wójcik, Mirosław Wróbel, Slawa Matuszynska</i>	
STUDY OF THE STRETCH-FLANGEABILITY IMPROVEMENT OF DUAL PHASE STEEL.....	761
<i>Libo Pan, Jie Xiong, Zhijiang Zuo, Wen Tan, Wuxin Yu</i>	
EFFECTS OF ROLLING-PASS REDUCTION ON MICROSTRUCTURAL EVOLUTION AND MECHANICAL PROPERTIES OF SUS316LN STAINLESS STEEL.....	765
<i>Hiromi Miura, Masakazu Kobayashi, Norimitsu Koga, Chihiro Watanabe</i>	
HOT WORKABILITY OF 420 J1 MARTENSITIC STAINLESS STEEL.....	771
<i>Maha El-Meligy, Taher El-Bitar</i>	
EFFECT OF DIRECT QUENCHING ON THE MECHANICAL PROPERTIES OF COLD FORMED S500 RECTANGULAR HOLLOW SECTION.....	777
<i>Antti Kaijalainen, Juho Mourujärvi, Juha Tulonen, Petteri Steen, Jukka Kömi</i>	
RAPID ALLOY PROTOTYPING FOR A RANGE OF STRIP RELATED ADVANCED STEEL GRADES.....	784
<i>Didier Farrugia, Stephen Brown, Nicholas P. Lavery, Cameron Pleydell-Pearce, Claire Davis</i>	
QUANTITATIVE EVALUATION OF EXPERIMENTAL WEAR BEHAVIOUR FOR CRN-COATED TOOL STEELS IN SHEET METAL FORMING PROCESS OF TRIP 1180.....	791
<i>Junho Bang, Junghan Song, Gihyun Bae, Namsu Park, Honggee Kim</i>	
NOVEL APPROACH TO DECREASE SHEET THINNING DURING SHEET METAL FORMING BY USING EMBOSsing TECHNIQUE	795
<i>Stefan Walzer, Mathias Liewald</i>	

DEVELOPMENT, STRUCTURE AND PROPERTIES OF CU/MG AND AL/MG COMPOSITE WIRES	800
<i>Azambek Kalonov, Andrey Glukhov, Aleksey Volkov</i>	
THE INFLUENCE OF THE PARAMETERS OF HOT DRAWING OF MGCA ALLOYS WIRES ON THE MECHANICAL PROPERTIES THAT DETERMINE THE APPLICABILITY OF THE MATERIAL AS A HIGH STRENGTH BIODEGRADABLE SURGICAL THREAD	804
<i>Andrij Milenin, Piotr Kustra, Dorota Byrska-Wójcik, Mirosław Wróbel, Valeriy Pidvysots'Kyy</i>	
DYNAMIC RECRYSTALLIZATION AND TEXTURE EVOLUTION OF MG-6.8Y-2.5ZN-0.3ZR ALLOY DURING HOT ROLLING	809
<i>Madlen Ullmann, Kristina Kittner, Thorsten Henseler, Christina Krbetschek, Ulrich Prah</i>	
EFFECT OF FORGING STEPS ON MICROSTRUCTURE EVOLUTION AND MECHANICAL PROPERTIES OF TI-6AL-4V ALLOY DURING MULTIDIRECTIONAL ISOTHERMAL FORGING	817
<i>Zhixiong Zhang, Tao Wang, Peng Lin</i>	
EFFECT OF VARIABLE TEMPERATURE REPETITIVE UPSETTING-EXTRUSION ON MICROSTRUCTURE AND TEXTURE OF MG-GD-Y-ZR ALLOY	822
<i>Yingze Meng, Jianmin Yu, Huisheng Yu, Yaojin Wu, Zhimin Zhang</i>	

Author Index