

Table of Contents

Committees

Preface

Evening Lecture

The Early History of Neutron Stress Measurements

A. Krawitz 3

Chapter 1. PROCESSING

Determination of Residual Stress Distribution in Severe Surface Deformed Steel by Shot Peening

Y. Akiniwa and H. Kimura 15

Variation of Residual Stresses in Drawn Copper Tubes

A. Carradò, D. Duriez, L. Barrallier, S. Brück, A. Fabre, U. Stuhr, T. Pirling, V. Klosek and H. Palkowski 21

Experimental Investigation of Residual Stresses after Heat Treatment and Grinding

Processes in the Production of Ball Bearing Rings

V. Güley, A.E. Tekkaya, T. Savaş and F. Özhan 27

Mechanical and Physical Analysis of Alloys Samples Produced with a New High Centrifugal Rate Machine

I. Lopez, A. Benmarouane, H. Bonnefoy, P. Millet and A. Lodini 33

Influence of Microstructural Parameters on Macroscopic Residual Stress Analysis of Complex Materials by Neutron Diffraction Methods

J. Repper, M. Hofmann, C. Krempaszky, W. Petry and E. Werner 39

Residual Stress and Microstructural Variations in Thick Aluminium Alloy forgings

J.S. Robinson, C.E. Truman, M.S. Hossain and R.C. Wimpory 45

Effect of Varying Cold-Drawing Deformation on Residual Stresses Measured by Neutron Diffraction in Steel Rods

J. Ruiz-Hervias, V. Luzin, H. Prask, T. Gnaeupel-Herold and M. Elices Calafat 51

Application of Neutron Diffraction Technique to Industrial Materials

S. Takahashi, T. Sasaki, Y. Sato, K. Iwafuchi, H. Suzuki, Y. Morii, Y. Kondo, R. Monzen and Y. Hirose 57

Neutron Strain Investigations of Laser Bent Samples

A.M. Venter, M.W. van der Watt, R.C. Wimpory, R. Schneider, P.J. McGrath and M. Topic 63

Residual Stress in α -Brass during Annealing

R. Wawszczak, A. Baczmanski, K. Wierzbowski, S. Wroński, C. Braham and W. Seiler 69

Chapter 2: PLASTICITY

Rod-Textured Zircaloy-2: A Case Study of an Anisotropic Metal with Multiple Deformation Modes, Strong Texture and Thermal Strains

T. Holden 77

Instrumented Indentation Testing on Uniaxially Prestressed Steel Samples

J. Gibmeier and B. Scholtes 83

In Situ Analysis of Deformation Mechanisms of Cu-Based fcc Materials under Uniaxial Loading

V. Klosek, M.H. Mathon, M.H. Aouni, R. Chiron and V. Ji 89

Evaluation of the Residual Stresses and Determination of the Proportion of Residual Austenite in an Austempered Ductile Iron Having Undergone Thermo Mechanical Treatments

E. Labbe, F. Serban, M. Nicoară and A. Lodini 95

Temperature Dependence of Residual Stress Gradients in Shot-Peened Steel Coated with CrN	101
K.J. Martinschitz, C. Kirchlechner, R. Daniel, G. Maier, C. Mitterer and J. Keckes	
In Situ Neutron Diffraction Studies of the Pseudoelastic-Like Behaviour of Hydrostatically Extruded Mg-Al-Zn Alloy	107
O. Muránsky, D.G. Carr, P. Šittner, E.C. Oliver and P. Dobroň	
A Study of Residual Elastic Strain Distribution in an AZ91 Mg Alloy Bar Loaded in Four Point Bending	113
D.G.L. Prakash, W.J.J. Vorster, S.Y. Zhang and A.M. Korsunsky	
Investigation of the Stress Fields Around a Fatigue Crack in Aluminium Alloy 5091	119
M. Rahman, M.E. Fitzpatrick, L. Edwards, S. Pratihar, M.J. Peel, A. Steuwer and T. Buslaps	
Study of Elasto-Plastic Anisotropic Response of Stainless Steel Weld Metal Using Neutron Diffraction	125
S. Sharma, M. Turski, M.E. Fitzpatrick and L. Edwards	
Neutron Diffraction Analysis of Stresses in an In-Plane Biaxially-Fatigued Stainless Steel Sample of Cruciform Geometry	131
Y.V. Taran, A.M. Balagurov, J. Schreiber and A.M. Korsunsky	
Neutron Diffraction Measurement and Finite Element Modelling of Residual Strains Due to Bath and Spray Quenching of AISI 316L Stainless Steel Cylinders	137
W.J.J. Vorster, M.W. van der Watt, A.M. Venter, E.C. Oliver and A.M. Korsunsky	
Stored Energy of Plastic and Elastic Origin and Recrystallization	143
K. Wierzbanowski, A. Baczmanski, J. Tarasiuk, P. Lipiński and A. Lodziń	
Development of Intergranular Stresses during <i>In Situ</i> Compression Tests in Zircaloy-4	149
O. Zanellato, M.E. Fitzpatrick, M.R. Daymond, L. Edwards and M. Turski	

Chapter 3: METHODS

Monte Carlo Simulation to Macro Stress Evaluation and Micro Strain Analysis by Neutron and Synchrotron Radiation Diffraction	157
J.M. Sprauel	
Neutron Diffraction Study of a New Generation of Implants	163
A. Benmarouane, H. Citterio-Bigot, T. Hansen, P. Millet and A. Lodziń	
Investigation of Retained Strains and Microstructures for a Hot Deformed Stainless Steel	169
M. Candic, B.H. Tian, S. Kleber, M. Wießner, M. Kamaya and C. Sommitsch	
Neutron Diffraction Study of Duplex Stainless Steel during Loading at 200°C	175
R. Dakhlaoui, A. Baczmanski, C. Braham, S. Wroński, K. Wierzbanowski and E.C. Oliver	
Single-Line Diffraction Profile Analysis Method Used for Evaluation of Microstructural Parameters in the Plain Ferritic Steel upon Tensile Straining	181
V. Davydov, P. Lukáš, P. Strunz and R. Kužel	
Improvements in Energy Dispersive Diffraction in Respect of Residual Stress Analysis	189
I.A. Denks and C. Genzel	
<i>In Situ</i> Investigation of the Deformation Behaviour of the Wrought Mg Base Alloy AZ31 Using Energy Dispersive Synchrotron Diffraction	195
J. Gibmeier, M. Klaus and B. Scholtes	
First Results of the DITO-Experiment at the HARWI II Beamline at GKSS/DESY	201
B. Hasse, H. Rahn, S. Odenbach, F. Beckmann and W. Reimers	
Diffraction Contrast Tomography - A Synchrotron Radiation Technique for Mapping Polycrystalline Microstructures in 3D	207
A. King, G. Johnson and W. Ludwig	
Kowari – The Residual-Stress Diffractometer for Engineering Applications at OPAL	213
O. Kirstein, A. Brule, H. Nguyen and V. Luzin	
A Critical Discussion of the $\sin^2\psi$ Stress Measurement Technique	219
A.M. Korsunsky	
Measurement of all Six Components of X-Ray Elastic Factors	225
B. Ortner, T. Antretter, M. Hofmann and E. Werner	
Use of Stored Energy Distribution in Stochastic Vertex Model	231
K. Piękoś, J. Tarasiuk, K. Wierzbanowski and B. Bacroux	

Imaging Diffraction Using Maxim at G3/Hasylab - Spatial Resolved Strain Measurements on Linear Friction Welded Dissimilar Materials (AA7020-T6/Ti6AlV	
A. Rothkirch and S. Lenser	237
Two-Dimensional Mapping of Crack-Face Bridging Stresses in Alumina Using Synchrotron Micro X-Ray Beam	
Y. Sakaida and S. Mori	243
Application of Synchrotron Radiation to Residual Stress Analysis by IP/cosa Method	
T. Sasaki, Y. Miyazawa, S. Takahashi, R. Matsuyama, K. Sasaki and K. Hiratsuka	249
Influence of Peak Determination Method on Area Detector Type Neutron Stress Measurement	
T. Sasaki, S. Takahashi, Y. Kobayashi, Y. Morii and N. Metoki	255
The High Energy Materials Science Beamline at PETRA III	
N. Schell, R.V. Martins, F. Beckmann, H.U. Ruhnau, R. Kiehn and A. Schreyer	261
Measurement of Internal Strain in Materials Using High Energy White X-Ray at SPring-8	
J. Shibano, T. Shobu, K. Suzuki, K. Kiriyama, K. Kajiwara, H. Kaneko and M. Kobayashi	267
Inter-Granular Residual Stresses in Polycrystalline Aggregates: Finite Element Modelling and Diffraction Post-Processing	
X. Song, S.Y. Zhang, D. Dini and A.M. Korsunsky	271
Experimental/Modelling Study of Residual Stress in Al/SiC_p Bent Bars by Synchrotron XRD and Slitting Eigenstrain Methods	
X. Song, S. Chardonnet, G. Savini, S.Y. Zhang, W.J.J. Vorster and A.M. Korsunsky	277
Problems in the Averaging of Neutron Diffraction Stress Data from Round-Robin Campaigns	
R.C. Wimpory, C. Ohms, M. Hofmann, R. Schneider and A.G. Youtsos	283
Corrections for Residual Stress in X-Ray Grazing Incidence Technique	
S. Wroński, K. Wierzbanowski, A. Baczmanski, C. Braham and A. Lodini	289
Analysis of Residual Stresses Around ‘Dimpled’ Cold-Expanded Holes in Aluminium Alloy Plates	
S.Y. Zhang, J. Schlipf and A.M. Korsunsky	295

Chapter 4: CERAMICS

X-Ray Powder Diffraction Characterization of Residual Stresses and Strains in Y₃Al₅O₁₂:Nd³⁺ Nanoceramics	
R. Fedyk, J. Hölsä, D. Hreniak, M. Lastusaari, V.P. Lehto, W. Łojkowski, W. Stręk and M. Tenho	303
Neutron Diffraction Studies of Residual Stresses in Functionally Graded Alumina/Zirconia Ceramics	
P. Lukáš, M. Vrána, J. Vleugels, G. Anné and O. Van der Biest	309
Through-Thickness Residual Stress Measurement in Metal and Ceramic Spray Coatings by Neutron Diffraction	
V. Luzin, A. Valarezo and S. Sampath	315
Measurement of Strain Distribution around Weld Zone for Railway Carbody Structure Using High-Energy Synchrotron Radiation	
K. Matsumoto, T. Shobu, Y. Akiniwa, T. Yagi and M. Yamamoto	321
Residual stresses in Al₂O₃/Y-TZP Ceramic Laminates Fabricated by Tape and Slip Casting	
J. Ruiz-Hervias, G. Bruno, J. Gurauskis, A.J. Sanchez-Herencia and C. Baudin	327
Distribution of Residual Stresses in EB-PVD Thermal Barrier Coatings	
K. Suzuki, T. Shobu and K. Tanaka	333
In Situ Synchrotron Measurement of Internal Stresses in Solid-Oxide Fuel Cell during Red-Ox Cycle	
K. Tanaka, Y. Akiniwa, H. Kimura, K. Ukai, M. Yokayama and Y. Mizutani	339

Chapter 5: WELDS

Study of Microstructure and Residual Stresses in Dissimilar Al/Steels Welds Produced by Cold Metal Transfer	
L. Agudo, S. Weber, H. Pinto, E. Arenholz, J. Wagner, H. Hackl, J. Bruckner and A. Pyzalla	347

Analysis of Residual Stress in Laser Welded Aerospace Aluminium T-Joints by Neutron Diffraction and Finite Element Modelling	355
F.S. Bayraktar, P. Staron, M. Koçak and A. Schreyer	
Microstructure and Residual Stresses in Dissimilar Mg-Al-Zn-Alloy Single Overlap Laser Beam Welds	361
R.S. Coelho, A. Kostka, H. Pinto, S. Riekehr, M. Koçak and A. Pyzalla	
Study of Residual Stress Distribution in a Stainless Steel Bead-on-Plate Simulation Benchmark Sample	367
S. Ganguly, S. Pratihar, M.E. Fitzpatrick and L. Edwards	
Influence of the Welding Sequence on Residual Stresses in Laser Welded T-Joints of an Airframe Aluminium Alloy	375
W. Machold, P. Staron, F.S. Bayraktar, S. Riekehr, M. Koçak and A. Schreyer	
Residual Stress Analyses by Neutron Diffraction in Irradiated Double-V Butt Welded Steel Plates	381
D. Neov, C. Ohms, R.C. Wimpory and A.G. Youtsos	
Residual Stresses in High Strength, Thick Section Steel Welds	387
S.V. Pearce and V. Linton	
<i>In Situ</i> Monitoring of Weld Transformations to Control Weld Residual Stresses	393
H.J. Stone, H.K.D.H. Bhadeshia and P.J. Withers	

Chapter 6: COMPOSITES

SXRD Measurements of Residual Stresses in Sintered Diamond–Cobalt Composites	401
H.A. Crostack, U. Selvadurai-Lassl, G. Fischer and A. Rothkirch	
Synchrotron Energy-Dispersive X-Ray Diffraction Analysis of Residual Strains around Friction Welds between Dissimilar Aluminium and Nickel Alloys	407
T.S. Jun, S.Y. Zhang, M. Golshan, M.J. Peel, D.G. Richards and A.M. Korsunsky	
Residual Stresses and Void Kinetics in AlSiC MMCs during Thermal Cycling	413
M. Schöbel, G.C. Requena, H. Kaminski, H.P. Degischer, T. Buslaps and M. Di Michiel	

Chapter 7: THIN FILMS

Position Resolved Residual Stress Determination in Alumina-Zirconia Multilayered Ceramics	421
G.A. Maier, J. Keckes, J. Brechbuehl, H. Guerault and R. Bermejo	