

Local Mechanical Properties X

Selected, peer reviewed papers from the 10th International Conference on Local Mechanical Properties (LMP 2013),
November 6-8th, 2013, Kutná Hora, Czech Republic

von
Petr Haušild

1. Auflage

Trans Tech Publications 2014

Verlag C.H. Beck im Internet:
www.beck.de
ISBN 978 3 03835 062 0

Table of Contents

Preface, Organizing Committee and Sponsors

I. Metals and Alloys

Local Characteristics of Ductile Fracture Surface in Spheroidized Steels	
B. Strnadel	3
Characterization of Local Stress-Strain Behavior in WWER 440 Weld and Base Metal by Instrumented Indentation Technique	
P. Haušild, A. Materna, J. Siegl, M. Kytka and R. Kopřiva	7
Identification of Stress-Strain Relation of Aluminium Foam Cell Wall by Spherical Nanoindentation	
V. Králík, J. Němeček and P. Koudelka	11
Characterisation of Mechanical Properties by Small Punch Test	
J. Siegl, P. Haušild, A. Janča, R. Kopřiva and M. Kytka	15
Microstructure and Mechanical Properties of Al-Mn Sheets with Zr Addition	
M. Vronka and M. Karlík	19
Local Strain Hardening and Non-Uniformity of Plastic Strain of Tinplate	
J. Slota, E. Spišák and M. Jurčišin	23
Effect of Boriding Time on Microstructure and Residual Stresses in Borided Highly Alloyed X210CR12 Steel	
Z. Pala, R. Mušálek, J. Kyncl, P. Harcuba, J. Stráský, K. Kolařík, N. Ganev and J. Matějíček	27
Evaluation of Fatigue Strength of Heat Treated and Laser Hardened 42CrMo4 Steel Considering Localized Initiation Mechanisms	
I. Černý, J. Šís and D. Mikulová	31
Prediction of Tensile Properties Based on Hardness Measurement	
P. Zubko and L. Pešek	35
Inspection of Local Influenced Zones in Micro-Scale Aluminium Specimens	
P. Zlámal, T. Doktor, P. Koudelka, T. Fila, D. Kytyř, O. Jiroušek, V. Králík and J. Němeček	39
Application of Small Punch Tests for Screening of Mechanical Properties for T91 Steel	
M. Lašan	43
The Effect of Microstructural Features on Mechanical Properties	
E. Anisimov, J. Manak, M. Puchnín and P. Sachr	47

II. Mechanics of Contact

Densification as the Only Mechanism at Stake during Indentation of Silica Glass?	
V. Keryvin, S. Gicquel, L. Charleux, J.P. Guin, M. Nivard and J.C. Sangleboeuf	53
Energy Aspects of Concentrated Contact and Instrumented Indentation	
J. Menčík	61
A Numerical Study of the Effect of the Berkovich Indenter Orientation on the Elastic Response of Anisotropic Material	
A. Materna and P. Haušild	65
Constant Load Testing of Materials Using Nanoindentation Technique	
P. Král, J. Dvořák, M. Kvapilová, J. Lukeš and V. Sklenicka	69
Numerical Model of Instrumented Indentation by a Rounded Cone Indenter Using Finite Element Method	
L. Kocmanová, P. Haušild, A. Materna and J. Matějíček	73
Influence of Drill Wear to Local Plastic Deformation in the Wall of Drilling Hole	
M. Martinkovič, P. Pokorný and P. Bodíšová	77
Effect of Pile-Up on the Mechanical Characteristics of Steel by Depth Sensing Indentation	
P. Burík, L. Pešek and L. Voleský	81

III. Experimental Methods

***In Situ* Detection of Surface Micro-Cracking in Ultrafine-Grained AZ31 Magnesium Alloy by Resonant Ultrasound Spectroscopy**

H. Seiner, P. Sedlák, L. Bodnárová, M. Landa, J. Stráská and M. Janeček 87

Effect of Grit-Blasting on Residual Stress Field

O. Kovářík, P. Haušild, Z. Pala, P. Sachr and V. Davyдов 91

Non-Destructive Identification of Defects in Power Support Structure Foundations by Means of Acoustic Techniques

L. Sadowski 95

Verification of the Trend of MPL Variation in Fatigue by Modern Methods

E. Gajdoš, M. Šperl, J. Frankl, J. Kaiser, V. Menth, J. Kyncl, J. Lukeš and R. Kužel 99

Two-Dimensional Isotropic Damage Elastoplastic Model for Quasi-Brittle Material

P. Beneš and D. Vavřík 103

Nanoindentation and AFM Studies on Tungsten Carbide Crystals in WC-Co Hardmetal

T. Csanádi, M. Bláhová, A. Duszová, P. Hvízdoš and J. Dusza 107

Determination of Material Acoustic Features Using Small Samples

J. Holub, B. Desbos, V. Vacek and J. Kolísko 111

IV. Bioapplications

Nanoindentation Derived Mechanical Properties of the Corneoscleral Rim of the Human Eye

P. Eberwein, J. Nohava, G. Schlunck and M. Swain 117

Micromechanical Properties of Polyacrylamide Hydrogels Measured by Spherical Nanoindentation

J. Nohava, M. Swain and P. Eberwein 121

Modeling and Measurement of the Effective Young Modulus of Porous Biomedical Materials Manufactured via SLM

D. Joguet, Y. Danlos, R. Bolot, G. Montavon and C. Coddet 125

Wear of Human Enamel and Dentin

R. Ctvrtilk and J. Tomastik 129

Nanoindentation of Human Tooth Dentin

A. Jíra and J. Němeček 133

Modeling of Stress Distribution in Dental Implant in Frontal Part of Mandible

D. Németh, J. Kučera, F. Lofaj and V. Ivančo 137

Micro-CT Based Imaging and Numerical Analysis of Bone Healing

K. Řehák and B. Skallerud 141

Corrosion Behavior of Human Teeth Measured by Nanoindentation Method

M. Kašiarová, D. Galusková, Z. Vilčeková, P. Tatarko, P. Gaalová and D. Galusek 145

V. Coatings and Layers

Residual Stresses and Young's Moduli of Plasma Sprayed W+Cu Composites and FGMS Determined by *In Situ* Curvature Method

J. Matějíček, R. Mušálek and P. Chráska 151

Relationships between Microstructural and Mechanical Properties of Plasma Sprayed AlSi-Polyester Composite Coatings: Application to Abradable Materials

Y. Duramou, R. Bolot, J.L. Seichepine, Y. Danlos, P. Bertrand, G. Montavon and S. Selezneff 155

Study of the Nanoindentation Induced Defects in Nanocomposite n-TiC/a-C:H Films

V. Buršíková, J. Buršík, L. Zábranský, P. Vašina, P. Souček and V. Peřina 159

The Effect of PVD Tungsten-Based Coatings on Improvement of Hardness and Wear Resistance

J. Horník, D. Tondl, P. Sachr, E. Anisimov, M. Puchnin and T. Chraska 163

Thermomechanical Properties of CoNiCrAlY-BN-Polyester Composite Coatings Elaborated by Atmospheric Plasma Spraying	167
D. Aussavy, R. Bolot, F. Peyraud, G. Montavon and S. Selezneff	
The Influence of Spraying Parameters on Stresses and Mechanical Properties of HVOF-Sprayed Co-Cr-W-C Coatings	171
J. Matějíček, Š. Houdková Šimůnková, O. Bláhová and Z. Pala	
The Influence of Indentation Conditions on Nanohardness Depth Profiles of W-C Based Coatings	175
M. Novák, F. Lofaj and P. Hviščová	
Mechanical Properties of HVOF Sprayed, Flame and Laser Remelted NiCrBSi Coatings	179
Š. Houdková, E. Smazalová, O. Bláhová and M. Vostřák	
Influence of Preheating Temperature on the Quality of the Interface between Plasma Sprayed Coatings and Substrate	183
M. Vílémová, B. Nevrálá, J. Matějíček and R. Mušálek	
Evaluation of Failure Micromechanisms of Advanced Thermal Spray Coatings by <i>In Situ</i> Experiment	187
R. Mušálek, C. Taltavull, A.J.L. Galisteo and N. Curry	
Nanohardness of CrN Coatings versus Deposition Parameters	191
P. Hviščová, F. Lofaj and M. Novák	

VI. Polymers, Ceramics and Composites

Influence of the Microstructure on Macro/Micro versus Nanohardness of SiC Ceramics	197
A. Kovalčíková, J. Dusza and P. Šajgalík	
Mechanical Properties of Nanotextiles Determined with Digital Image Correlation	201
J. Němeček and I. Jandejsek	
Spark Plasma Sintering of Multilayer Ceramics – Case Study of Al_2O_3-Mg(Ca)TiO₃ Sandwich	205
P. Ctibor, T. Kubatík and P. Chráska	
Influence of the Interface and Residual Stresses on the Apparent Fracture Toughness of Layered Ceramic Composites Based on Alumina-Zirconia	209
L. Náhlík, B. Máša and P. Hutař	
Determination of Local Mechanical Properties of Si_3N_4 Based Foams	213
Z. Vilčeková, M. Kašiarová, M. Domanická and P. Šajgalík	
Hardness and Micro-Indentation Hardness Comparison of Recycled Modified HDPE	217
J. Navratil, M. Manas, M. Stanek, D. Manas, M. Ovsík, M. Bednárik and A. Mizera	
Influence of Carbon Nanotubes on the Mechanical Properties and Morphology of the Thermoplastic Polymer Matrix of the Polyamide 6	221
J. Vácha	
Computer Nonlinear Analysis of the Formation and Development of Cracks in a Travertine Stone Pavement Exposed to Bending Stress Caused by a Single Load	225
P. Tej, V. Vacek, J. Kolísko and J. Čech	
Computer Nonlinear Analysis of the Formation and Development of Cracks in a Reinforced Concrete Slab Loaded by a Planar Uniform Load	229
P. Tej, V. Vacek, J. Kolísko and J. Čech	
Corelation of Results of Creep and Micro-Indentation Creep for PP-Copo	233
M. Reznicek, M. Ovsík, D. Manas, A. Skrobák, M. Stanek and V. Senkerík	
Local Viscoelastic Properties of a Thermoplastic/Carbon Laminate as an Indicator of Fatigue Damage	237
J. Minster, M. Sperl and J. Lukeš	
Instrumented Indentation of Composite Materials Prepared by Methods of Mechanochemistry	241
J. Balko, P. Hvízdoš, J.M. Córdoba and E. Chicardi	
Inspection of Post Impact Fatigue Damage in Carbon Fibre Composite Using Modulus Mapping Technique	245
P. Koudelka, T. Fíla, T. Doktor, D. Kytýř, J. Valach, J. Šepitka and J. Lukeš	
Mechanical Properties of Rubber Samples	249
A. Skrobák, M. Stanek, D. Manas, M. Ovsík, V. Senkerík and M. Reznicek	

Micro-Hardness and Morphology of LDPE Influenced by Beta Radiation	
M. Ovsik, P. Kratky, D. Manas, M. Manas, M. Stanek and M. Bednarik	253
Nanohardness of Electron Beam Irradiated Polyamide 6.6	
D. Manas, M. Ovsik, M. Manas, M. Stanek, K. Kocman, M. Bednarik and P. Kratky	257
Particulate Composite Damage: Numerical Estimation of Micro-Crack Paths	
Z. Majer, P. Hutař, M. Ševčík and L. Náhlík	261
Surface and Adhesive Properties of Low-Density Polyethylene after Radiation Cross-Linking	
M. Bednarik, D. Manas, M. Manas, M. Ovsik, J. Navratil and A. Mizera	265