

# Table of Contents

## Preface, Committee

## Chapter 1: Degradation of Materials and Failure Analysis

|                                                                                                                                                                                                                                                                             |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Using Fractography for Determining of Technological Reasons of Defect and Brittle Fractures Occurrence in Steels</b><br>J. Bezecný and I. Barényi                                                                                                                        | 3  |
| <b>The Analysis of Causes of Pressure Bottles Heads Destruction</b><br>M. Švec and P. Kejzlar                                                                                                                                                                               | 15 |
| <b>Material Analysis of the Extended-Life Cobalt-Based Superalloys Used in the Manufacturing of Glass Tools</b><br>P. Jonšta, I. Vlčková, Z. Jonšta and M. Król                                                                                                             | 21 |
| <b>Operational Degradation of Spheroidal Graphite Cast Iron EN GJS SiMo</b><br>B. Skrbek                                                                                                                                                                                    | 27 |
| <b>Structural Changes of Hot Work Tool Steel due to Heat load</b><br>S. Krum, F. Pešlová, J. Horník and M. Puchnin                                                                                                                                                          | 34 |
| <b>Failure Mechanism of Yttria Stabilized Zirconia Atmospheric Plasma Sprayed Thermal Barrier Coatings Subjected to Calcia-Magnesia-Alumino-Silicate Environmental Attack</b><br>L. Čelko, D. Jech, P. Komarov, M. Remešová, K. Dvořák, I. Šulák, B. Smetana and K. Obrtlík | 39 |
| <b>Failures of Engineering Structures Caused by Weld Imperfections</b><br>V. Mára, J. Horník, E. Čižmarová, J. Krčil and P. Hájková                                                                                                                                         | 45 |
| <b>Fractographical Analysis of Screws Used for Truck Cab Holding</b><br>P. Kejzlar, M. Švec and Z. Andršová                                                                                                                                                                 | 52 |
| <b>Causal Analysis of Damage of a Cover</b><br>L. Páleníková, L. Klakurková, P. Gejdoš, M. Remešová, M. Juliš and L. Čelko                                                                                                                                                  | 57 |
| <b>Analysis of Damage of Solder Joint of Heat Exchanger</b><br>P. Gejdoš, L. Klakurková, M. Juliš, M. Horynová, L. Páleníková and J. Švejcar                                                                                                                                | 63 |
| <b>Failure Analysis of Corrugated Hoses</b><br>L. Klakurková, M. Horynová, M. Juliš, P. Gejdoš, L. Páleníková and J. Švejcar                                                                                                                                                | 68 |
| <b>The Influence of Microstructure on the Fracture Development in Engineering Parts</b><br>J. Horník, E. Čižmarová, S. Krum, J. Krčil and V. Mára                                                                                                                           | 74 |
| <b>Analysis of the Failure of the Engine Piston of the AlSi Alloy</b><br>A. Podepřelová, V. Mareš and M. Kraus                                                                                                                                                              | 80 |
| <b>Atypical Cases of Welded Structure Failures</b><br>P. Bernasovský                                                                                                                                                                                                        | 86 |
| <b>Analysis of Causes of Fractures of Terminal Board Bolts</b><br>J. Švejcar, L. Klakurková, M. Juliš, P. Gejdoš, M. Remešová and L. Páleníková                                                                                                                             | 93 |

## Chapter 2: Surface Defects and Surface Degradation

|                                                                                                                                                                                                     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Application of Metallography in Solving of Manufacturing Defects of Galvanically Plated Polymers</b><br>P. Podzimek, Z. Andršová and P. Kejzlar                                                  | 101 |
| <b>The Use of Metallography for Examination of Causes of Surface Defects on Visual Parts</b><br>Z. Andršová and P. Kejzlar                                                                          | 107 |
| <b>Influence of Microstructure on Machinability of Material and its Final Surface Quality</b><br>Z. Pavloušková, M. Horynová, L. Klakurková, M. Juliš, P. Gejdoš and M. Remešová                    | 112 |
| <b>Application of Metallographic Analysis Techniques for Detection and Identification of Spray Paint Defects</b><br>M. Remešová, L. Klakurková, I. Ročňáková, L. Čelko, L. Páleníková and J. Kaiser | 118 |
| <b>Influence of the Surface Condition of Specimens on the Size of Coherently Diffracting Domains</b><br>J. Klečka, F. Lukáč and M. Dudr                                                             | 124 |

|                                                                                                                                                                   |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Evaluation of Titanium Carbonitride Particles Using Image Analysis and Assessment of their Impact on Machinability</b><br>P. Martínek, J. Mišková and P. Sláma | 130 |
| <b>Evaluation of Surface Degradation of Deoxidized AW-AlMg0.7Si Alloy</b><br>M. Horynová, M. Remešová, L. Klakurková, M. Juliš, P. Gejdoš and L. Páleníková       | 136 |
| <b>Metallographic Analysis of Filiform Corrosion</b><br>L. Hrabčáková and A. Mašlejová                                                                            | 142 |

## **Chapter 3: Degradation of Materials and Failure Analysis of Power Equipment**

|                                                                                                                                                                                                     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Analysis of Corrosion Attack on Kaplan Turbine Blades</b><br>J. Horník, P. Zuna, M. Zoubek, M. Svobodová and T. Chmela                                                                           | 149 |
| <b>Analysis of Pipeline Serviceability for Water Supply to Power Plant</b><br>E. Chvostová, P. Podaný and P. Konopík                                                                                | 156 |
| <b>Development of Creep Damage in Similar Weld Joints of P92 Steel Pipe</b><br>P. Král, V. Sklenička, K. Kuchařová, M. Svobodová, M. Kvapilová and J. Dvořák                                        | 162 |
| <b>Combining 3D Scanning with Standard Microscopy Methods for Assessment of Pitting Corrosion in Turbine Blades</b><br>P. Bublíková, V. Habrcetl, P. Mareš, R. Janura, A. Kobzová and Z. Vávrovcová | 168 |
| <b>Failure of a Rotating Blade of a 200 MW Steam Turbine LP Rotor and Options for Eliminating other Similar Breakdowns</b><br>J. Kasl, M. Matějová and J. Mrštík                                    | 174 |
| <b>Quantitative Evaluation of Secondary Phases in a Weld Joint Made of COST F and FB2 Creep Resistant Steels</b><br>D. Jandová                                                                      | 183 |
| <b>The Analysis of Causes of the Damage of a Turbine Blade Made of Ti-6Al-4V Alloy</b><br>J. Krčil, J. Holec, J. Horník, P. Hájková, E. Čižmárová and V. Mára                                       | 189 |

## **Chapter 4: Analysis of Properties and Production Technologies of Coatings and Non-Ferrous Alloys**

|                                                                                                                                                                                                            |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Al-Fe Chips Processed by High-Energy Ball Milling and Spark Plasma Sintering</b><br>V. Kučera, F. Prusa and D. Vojtěch                                                                                  | 197 |
| <b>AZ31 and WE43 Alloys for Biomedical Applications</b><br>D. Dvorský, J. Kubásek and D. Vojtěch                                                                                                           | 205 |
| <b>Metallographic and Fractographic Evaluation of 3D-Printed Titanium Samples to Eliminate Unsatisfactory Mechanical Properties</b><br>M. Fousová, T. Stejskalova and D. Vojtěch                           | 212 |
| <b>The Effect of Solution Treatment Temperature on Plastic Deformation and Fracture Mechanisms of Beta-Titanium Alloy</b><br>J. Malek, F. Hnilica, S. Bartáková and J. Veselý                              | 218 |
| <b>The Role of Different Atmospheric Plasma Spray Parameters on Microstructure of Abradable AlSi-Polyester Coatings</b><br>D. Jech, L. Čelko, P. Komarov, J. Ziegelheim, Z. Česánek and J. Schubert        | 224 |
| <b>Investigations of Wettability of Wear Resistant Coatings Produced by Atmospheric Plasma Spraying</b><br>P. Komarov, L. Čelko, D. Jech, M. Papula, K. Slámečka, M. Horynová, L. Klakurková and J. Kaiser | 230 |

## **Chapter 5: Analysis of Properties and Production Technologies of Steels**

|                                                                                                                                                                                                           |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Effects of Heat Treatment on Microstructure of High-Strength Manganese-Silicon Steels</b><br>D. Bublíková, Š. Jeníček, K. Opatová and B. Mašek                                                         | 239 |
| <b>Influence of Mechanical Stress at High Temperatures on the Properties of Steels Intended for the Manufacture of Fuel Cladding for Generation IV Reactors</b><br>Z. Špirit, M. Chocholoušek and M. Šíma | 246 |

|                                                                                                                                                       |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>The Effect of Isothermal Hold Temperature on Microstructure and Mechanical Properties of TRIP Steel</b>                                            |     |
| L. Kučerová, M. Bystrianský and J. Káňa                                                                                                               | 253 |
| <b>Effect of Chemical Composition and Heat Treatment Parameters on the Structure and Properties of Vanadis 23 and Vanadis 30 PM High-Speed Steels</b> |     |
| J. Sobotová, M. Kuřík and J. Lacza                                                                                                                    | 258 |
| <b>Characterization of Microstructure of Hadfield Steel</b>                                                                                           |     |
| V. Průcha, Z. Jansa, J. Šimeček, O. Žďánský and A. Kříž                                                                                               | 265 |
| <b>Analysis of Wrought Iron Metal Part of Cupola Construction in the Main Railway Station Plzeň from 1907</b>                                         |     |
| M. Matějová, R. Fikrlová and J. Kasl                                                                                                                  | 271 |