

Table of Contents

Preface.....	v
Keynote: The Tempering of Carbon and Alloy Steels..... <i>J. Nutting</i>	3
LIGHT WATER REACTORS - APPLICATION AND EXPERIENCE	
The Use of Ferritic Materials in Light Water Reactor Power Plants..... <i>T. U. Marston</i>	19
Design of Aging - Resistant Martensitic Stainless Steels for Pressurized Water Reactors..... <i>Y. Meyzaud and R. Cozar</i>	27
A Microstructural Basis for the Prediction of Embrittlement in Pressure Vessel Steels..... <i>R. G. Lott</i>	37
Bauschinger Effect and Buckling Behavior of the Pressure Vessel Steel 20 MnMoNi 5 5..... <i>B. Scholtes, O. Vohringer, and E. Macherlauch</i>	45
Caustic Cracking of 2 1/4 CrMo Steel..... <i>H. C. Cowen and A. W. Thorley</i>	51
Caustic Stress Corrosion Behavior of 2 1/4 Cr-1Mo Steels..... <i>G. P. Wozadlo and P. Roy</i>	57
Corrosion Resistance Improvement of Ferritic Steels through Hydrogen Additions to the BWR Coolant..... <i>B. M. Gordon, C. W. Jewett, A. E. Pickett, and M. E. Indig</i>	65
Mechanisms of Corrosion and Denting of Ferritic Steels in Aqueous Chloride at 300°C..... <i>J. P. Broomfield, J. E. Forrest, D. R. Holmes, and M. I. Manning</i>	77
Stress Relief Cracking of A533B Class 1 and A508 Class 3 Steels..... <i>B. C. Edwards, C. A. Hippesley and J. A. Hudson</i>	83
Flaw Tolerance of the AISI 403 End Fittings of CANDU Pressure Tubes..... <i>R. R. Hosbom</i>	91
Failure Analysis of Primary Manway Studs Removed from Two PWR Plants..... <i>G. O. Hayner, M. A. Rigdon, K. E. Moore, G. J. Theus and C. W. Hendrix</i>	97
LIQUID METAL COOLED FAST BREEDER REACTORS	
Use of Ferritic Steels in Breeder Reactors Worldwide..... <i>P. Patriarca</i>	107
Ferritics for Breeder Reactor In-Core Applications: A Survey of Alloys, Properties and Microstructures <i>W. L. Bell, T. Lauritzen, and S. Vaidyanathan</i>	113
EM-12, A Possible Fast Reactor Core Material..... <i>J. M. Dupouy, Y. Carteret, H. Aubert, and J. L. Boutard</i>	125
Design Optimization of Ferritic Alloy LMFBR Fuel Assemblies as Affected by In-Reactor Deformation..... <i>S. Kaplan and N. A. Deane</i>	129
The Predicted Performance of the Ferritic/Martensitic Alloy HT-9 in an FFTF Test of Mixed Oxide Fuel... <i>A. J. Lovell, D. R. Wilson, D. F. Leibnitz and W. H. Sutherland</i>	135
FUSION REACTOR SYSTEMS	
Ferritic/Martensitic Steels for Use in Near-Term and Commercial Fusion Reactors..... <i>D. R. Harries</i>	141
Ferritic Steel Applications in the MARS High Temperature Blanket..... <i>J. D. Gordon, J. K. Garner, N. M. Ghoniem and J. F. Farmer</i>	157
Implications of Using Ferromagnetic Steel in Mirror Fusion Reactors..... <i>H. Attaya, K. Y. Yuan, W. G. Wolfer, and G. L. Kulcinski</i>	169
An Assessment of Magnetic Effects in Ferromagnetic Martensitic Steels for Use in Fusion Machines..... <i>T. Lechtenberg, C. Dahms, and H. Attaya</i>	179

Selection of Alloy Steel Type for Fusion Power Applications in the 350-500°C Temperature Range.....	185
<i>N. M. Ghoniem, J. Blink, and N. Hoffman</i>	
Control of Activation Levels to Simplify Waste Management of Fusion Reactor Steel Components.....	195
<i>F. W. Wiffen and R. T. Santoro</i>	
Development of Low Activation Vanadium Steel for Fusion Applications.....	201
<i>N. M. Ghoniem, A. Shabait, and M. Z. Youssef</i>	
Compatibility of Ferritic Steels with Sintered Li ₂ O Pellets in a Flowing Helium Environment.....	209
<i>O. K. Chopra, T. Kurosawa, and D. L. Smith</i>	
Corrosion of an Fe-12Cr-1Mo VW Steel in Thermally-Convective Lithium.....	215
<i>P. F. Tortorelli and J. H. DeVan</i>	
The Performance of Ferritic Alloys in Advanced (DD and D ³ He) Fueled Inertial Confinement Fusion Reactors.....	223
<i>J. F. Stubbins and B. J. Adams</i>	
NON-NUCLEAR PLANT APPLICATIONS	
Experience with Ferritic and Martensitic Steel Tubes and Piping in Nuclear and Non-Nuclear Applications.....	235
<i>G. P. Kalwa, K. Haarmann, and K. J. Janssen</i>	
Ferritic Steels for French LMFBR Steam Generators.....	245
<i>M. Aubert, B. Mathieu and P. Petrequin</i>	
Welding of Alloyed Ferritic and Martensitic Steels in Piping Systems for High Temperature Service.....	253
<i>F. Bruhl and H. Musch</i>	
An Examination of the Potential for 9% Cr1%Mo Steel as Thick Section Tubeplates in Fast Reactors.....	261
<i>J. Orr and S. J. Sanderson</i>	
A Repair Technique for Defective Tube/Tubeplate Welds in the Dounreay Prototype Fast Reactor Evaporators.....	269
<i>F. S. Dickinson, A. F. Taylor, P. W. Jackson, and R. W. Smith</i>	
Ultrasonic Systems for Examining Butt-Fillet Tube to Tube Plate Welds in the Evaporators of the Dounreay Prototype Fast Reactor.....	281
<i>R. J. Hudgell, A. J. Willetts, D. W. Telford and I. R. Widdowson</i>	
ALLOY DEVELOPMENT	
Development of a Ferritic Low-Carbon Steel for Elevated Temperature Service.....	291
<i>E. J. Vineberg and T. B. Cox</i>	
Optimization Work on Niobium Stabilized 12% CrMoVNb Martensitic Steel for Breeder and Fusion Reactor Applications.....	299
<i>K. Anderko, K. David, W. Ohly, M. Schirra, and C. Wassilew</i>	
Newly Developed 9Cr-2Mo-Nb-V (NSCR9) Steel.....	307
<i>K. Hashimoto, M. Yamanaka, Y. Otoguro, T. Zaizen, M. Oroyama, and T. Fujita</i>	
Development of Modified 9 Cr-1Mo Steel for Elevated-Temperature Service.....	317
<i>V. K. Sikka</i>	
Fabrication and Mechanical Properties of ODS Ferritic Alloys Canning Tubes for Fast Reactor Fuel Pins.....	329
<i>J. J. Huet, L. Coheur, L. DeWilde, J. Gedopt, W. Hendrix, and W. Vandermeulen</i>	
FRACTURE	
Fracture Behavior of Unirradiated HT-9 and Modified 9Cr-1Mo Welds.....	337
<i>F. H. Huang and D. S. Gelles</i>	
The Effect of Heat Treatment on the Impact Properties of a 12Cr-1Mo-V-W Steel.....	347
<i>B. A. Chin and R. C. Wilcox</i>	
Effects of Composition and Thermal Treatment on Bend-Ductility Transition Temperature of 9Cr-1Mo Ferritic Steel.....	357
<i>O. N. Carlson and H. Indrawirawan</i>	

Effect of Heat Treatment and 550°C Thermal Aging on the Toughness and Hydrogen Compatibility of HT-9...	365
<i>T. A. Lechtenberg, W. M. Garrison, Jr., and J. M. Hyzak</i>	
Ageing Behavior and Toughness of 12% Cr Steels.....	371
<i>E. Tolksdorf, K. Schneider, and H. W. Grunling</i>	
Grain Boundary Carbides and Hydrogen Induced Intergranular Fracture of a 12 Chromium Secondary Hardening Steel.....	379
<i>W. M. Garrison, Jr., J. M. Hyzak, and T. A. Lechtenberg</i>	
Hydrogen Charged Tensile Fracture of a 12Cr-1Mo-0.3V Steel: Grain Boundary Embrittlement.....	385
<i>J. M. Hyzak and W. M. Garrison, Jr.</i>	
Hydrogen Embrittlement of a 12Cr-1Mo Steel.....	395
<i>R. H. Jones and M. T. Thomas</i>	
A Statistical Study of Inclusions and Fracture in a Ferritic Steel.....	405
<i>C. M. Gilmore, V. Provenzano, J. A. Sprague, and F. A. Smidt, Jr.</i>	
MECHANICAL PROPERTIES	
Creep Properties of Modified 9Cr-1Mo Steel.....	413
<i>V. K. Sikka, M. G. Cowgill, and B. W. Roberts</i>	
Relationship Between Microstructural Evolution, Mechanical Properties and Creep Behavior of 9%Cr-2% Mo-Nb-V Ferritic Steel.....	425
<i>P. Billard, J. R. Donati, D. Guttmann, M. Guttmann, S. Licheron, and J. C. Van Duysen</i>	
Influence of Composition and Thermomechanical Treatment on 9%Cr, 2%Mo, Nb, V Ferritic Steel Properties.	435
<i>N. F. Felsen, H. Aubert, J. Laniesse, and P. LeBret</i>	
Effects of Thermal Ageing and Decarburization on the Mechanical Properties of 2 1/4 Cr-1Mo Steel.....	443
<i>G. J. Licina and P. Roy</i>	
Mechanical Properties and Low Cycle Fatigue Behavior of Heat Treated Nb-Stabilized and Unstabilized 2.25Cr-1Mo Steel.....	451
<i>H. J. Breuer, E. teHeesen, H. Breitling, and E. D. Grosser</i>	
Microstructural Aspects of Fatigue Crack Propagation in a Pressure Vessel Steel 20 MnMoNi55.....	461
<i>W. V. Vaidya</i>	
Effects of Fatigue in the Elastic Regime on the Mechanical Properties of Nuclear Pressure Vessel Steels	471
<i>J. F. Stubbins and A. W. Riedy</i>	
Low Cycle Fatigue Behavior of HT-9 Alloy in a Flowing Lithium Environment.....	481
<i>O. K. Chopra and D. L. Smith</i>	
Sub-Critical Annealing of Cold Worked Steel.....	489
<i>M. H. Chang and J. G. Byrne</i>	
MICROSTRUCTURE AND MICROSTRUCTURAL EFFECTS	
The Effect of Post Weld Heat Treatment on the Microstructure and Properties of the Heat-Affected Zone in 12Cr-1Mo-0.3V (HT-9) Weldments.....	497
<i>J. C. Lippold</i>	
Mechanical and Microstructural Behavior of a Ferritic Stainless Steel Under High Temperature Cycling.....	507
<i>S. Matsuoka, S. Kim, and J. R. Weertman</i>	
The Effect of a Magnetic Field on Phase Transformations in Iron-Chromium Alloys.....	517
<i>I-Wei Chen, E. Faillace, and A. P. Miodownik</i>	
Magnetic Field Induced Growth of Ferromagnetic Materials Under Irradiation.....	525
<i>I-Wei Chen</i>	
Determination of the Magnetomechanical Effect in Inductively Heated Ferritic Steel Specimens.....	533
<i>W. B. Jones</i>	
The Effects of High Magnetic Fields on the Microstructure and Toughness of Cryogenic 9 Ni Steel.....	543
<i>G. O. Fior, B. Fultz, and J. W. Morris, Jr.</i>	
IRRADIATION EFFECTS	
Microstructure of HFIR-Irradiated 12Cr-1MoVW Ferritic Steel.....	551
<i>J. M. Vitek and R. L. Klueh</i>	

Effects of Neutron Irradiation on Microstructure in Experimental and Commercial Ferritic Alloys..... <i>D. S. Gelles and L. E. Thomas</i>	559
Swelling Behavior of A Simple Ferritic Alloy..... <i>L. L. Horton and J. Bentley</i>	569
On the Physical Basis for the Swelling Resistance of Ferritic Steels..... <i>J. J. Sniegowski and W. G. Wolfer</i>	579
The Role of Void Nucleation in the Swelling Resistance of 12 Cr Ferritic Steel..... <i>E. A. Little</i>	587
An Analysis of the Creep Properties of a 12 Cr-1Mo-W-V Steel..... <i>B. A. Chin</i>	593
In-Reactor Creep Behavior of Selected Ferritic Alloys..... <i>R. J. Puigh and G. L. Wire</i>	601
Irradiation Behavior of 12%Cr Martensitic Steels..... <i>C. Wassilew, K. Herschbach, E. Materna-Morris, and K. Ehrlich</i>	607
Tensile Behavior of Three Commercial Ferritic Steels After Low-Temperature Irradiation..... <i>R. L. Kleuh and J. M. Vitek</i>	615
Effects of Irradiation on the Mechanical Properties of Ferritic Alloys HT-9 and 2.25Cr-1Mo..... <i>T. Lauritzen, W. L. Bell, and S. Vaidyanathan</i>	623
Miniature Charpy Impact Test Results for the Irradiated Ferritic Alloys HT-9 and Modified 9 Cr-1Mo..... <i>W. L. Hu and D. S. Gelles</i>	631
Theory of Irradiation Microstructure and Hardening of Pressure Vessel Steels..... <i>E. P. Simonen</i>	647
Subject Index.....	655
Author Index.....	659