

CONTENTS TO PART B

Section 9. Mechanical properties and radiation effects – stainless steels

- 9.1. *Preirradiation microstructural development designed to minimize properties degradation during irradiation in austenitic alloys*, P.J. Maziasz and T.K. Roche 797
- 9.2. *The microstructural origins of yield strength changes in AISI 316 during fission or fusion irradiation*, F.A. Garner, M.L. Hamilton, N.F. Panayotou and G.D. Johnson 803
- 9.3. *Microstructural aspects of He embrittlement in type 316 stainless steel*, J.I. Bennetch and W.A. Jesser 809
- 9.4. *Tensile property correlation for 20% CW 316 stainless steel*, R.L. Simons 815
- 9.5. *The influence of neutron irradiation at 55°C on the properties of austenitic stainless steels*, F.W. Wiffen and P.J. Maziasz 821
- 9.6. *Tensile properties of 20% cold-worked titanium-modified type 316 stainless steel irradiated in HFIR*, M.L. Grossbeck and P.J. Maziasz 827
- 9.7. *Mechanical properties and structure of rapidly solidified high titanium stabilized 316 stainless steel*, E. Testart, J. Megusar, L. Arnberg and N.J. Grant 833
- 9.8. *“In-beam” simulation of high temperature helium embrittlement of DIN 1.4970 austenitic stainless steel*, H. Schroeder and P. Batfalsky 839
- 9.9. *Reduction of helium embrittlement in stainless steel by finely dispersed TiC precipitates*, W. Kesternich and J. Rothaut 845
- 9.10. *High-temperature fatigue life of type 316 stainless steel containing irradiation induced helium*, M.L. Grossbeck and K.C. Liu 853
- 9.11. *Fatigue properties of type 316 stainless steel under helium and hydrogen bombardment*, K. Sonnenberg and H. Ullmaier 859
- 9.12. *TEM observations of crack tip-cavity interactions*, J.A. Horton, S.M. Ohr and W.A. Jesser 865
- 9.13. *Fatigue crack propagation in type 316 stainless steel in vacuum and air environments*, D.J. Michel and H.H. Smith 871
- 9.14. *Hydrogen compatibility of HT-9 martensitic stainless steel*, J.M. Hyzak and R.E. Stoltz 877
- 9.15. *Evaluation of fracture resistance of ferritic stainless steels for first wall and blanket applications*, J.R. Hawthorne and F.A. Smidt, Jr. 883
- 9.16. *Effect of low-temperature irradiation with (n, α) helium production on tensile properties of 12 Cr–1 MoVW-type steels*, R.L. Klueh, J.M. Vitek and M.L. Grossbeck 887

Section 10. Mechanical properties and radiation effects – non-ferrous metals

- 10.1. *Tensile properties and microstructure of helium injected and reactor irradiated V-20 Ti*, M.P. Tanaka, E.E. Bloom and J.A. Horak 895
- 10.2. *Strength changes in vanadium and titanium irradiated with 14 MeV neutrons*, E.R. Bradley and R.H. Jones 901
- 10.3. *The mechanical behaviour of ion implanted vanadium and V–Ti alloys investigated by means of microhardness techniques*, D. Kaletta 907
- 10.4. *High temperature fatigue behavior of unirradiated V–15 Cr–5 Ti tested in vacuum*, K.C. Liu 913
- 10.5. *Titanium alloy tensile properties after neutron irradiation*, D.R. Duncan, R.J. Puigh and E.K. Opperman 919
- 10.6. *Effect of hydrogen on the mechanical properties at high temperature of fast-neutron irradiated Ti alloys*, Y. Higashiguchi, H. Kayano and M. Miyake 925
- 10.7. *Effect of hydrogen on flaw growth in Ti–6 Al–2 Sn–4 Zr–2 Mo–0.1 Si*, P.S. Pao, and G.W. Wille 931
- 10.8. *Effect of low cycle fatigue on the ductile-brittle transition of molybdenum*, K. Furuya, N. Nagata, R. Watanabe and H. Yoshida 937
- 10.9. *Tensile and low-cycle fatigue measurements on cross-rolled tungsten*, R.E. Schmunk and G.E. Korth 943

10.10. <i>Improvement of mechanical properties of Mo alloys in CTR gaseous environment</i> , T. Noda, M. Okada and T. Kainuma	949
10.11. <i>Damage development and hardening in 14 MeV neutron irradiation of copper alloys at 25°C</i> , H.R. Brager, F.A. Garner and N.F. Panayotou	955
10.12. <i>Potential for using rapid solidification for improved irradiation performance in the fusion environment</i> , J. Megusar, O.K. Harling and N.J. Grant	961
Section 11. Swelling and microstructure – stainless steels	
11.1. <i>Swelling of several commercial alloys following high fluence neutron irradiation</i> , R.W. Powell, D.T. Peterson, M.K. Zimmerschied and J.F. Bates	969
11.2. <i>Microstructural examination of several commercial ferritic alloys irradiated to high fluence</i> , D.S. Gelles	975
11.3. <i>Helium bubble formation and swelling in metals</i> , B.B. Glasgow, A. Si-Ahmed, W.F. Wolfer and F.A. Garner	981
11.4. <i>Swelling, microstructural development and helium effects in type 316 stainless steel irradiated in HFIR and EBR-II</i> , P.J. Maziasz and M.L. Grossbeck	987
11.5. <i>Comparison of the swelling and the microstructural/microchemical evolution of AISI 316 irradiated in EBR-II and HFIR</i> , H.R. Brager and F.A. Garner	993
11.6. <i>The effect of solid transmutation products on swelling in 316 stainless steel</i> , J.F. Bates, F.A. Garner and F.M. Mann	999
11.7. <i>The microstructure of neutron irradiated rapidly solidified Path A Prime Candidate Alloys</i> , L. Arnberg, J. Megusar, D. Imeson, H.J. Frost, J.B. Vander Sande, O.K. Harling and N.J. Grant	1005
11.8. <i>A scoping experiment to investigate the effects of simultaneous multi-energy ion bombardment, neutron irradiation and stress temperature cycling on 316 SS</i> , H. Andresen, G. Kohse, A.S. Argon and O.K. Harling	1011
11.9. <i>Void swelling and microchemical segregation in ion-irradiated 316 stainless steel</i> , M. Terasawa, S. Nakahigashi, H. Kamei, T. Takeyama, S. Ohonuki and H. Takahashi	1017
11.10. <i>Influence of temperature, stress and time on the formation of helium bubbles in type 316 stainless steel</i> , J. Rothaut and H. Schroeder	1023
11.11. <i>Effects of pulsed dual-ion irradiation on microstructural development</i> , N.H. Packan	1029
11.12. <i>Influence of helium injection rate on the microstructure of dual-ion irradiated type 316 stainless steel</i> , G. Ayrault, H.A. Hoff, F.V. Nolfi, Jr. and A.P.L. Turner	1035
11.13. <i>Effects of implanted helium on void nucleation during HVEM irradiation of stainless steel containing silicon</i> , B.N. Singh, T. Leffers, M.J. Makin, G.P. Walters and A.J.E. Foreman	1041
11.14. <i>Void swelling of modified 316 stainless steels observed in-situ by HVEM</i> , N. Igata, Y. Kohno, M. Saito and H. Tsunakawa	1047
11.15. <i>Void swelling in nitrogen-ion irradiated 316 stainless steel</i> , K. Shiraishi, T. Aruga and Y. Katano	1053
11.16. <i>Damage structure in nimonon PÉ16 alloy ion bombarded to high doses and gas levels</i> , K. Farrell and N.H. Packan	1059
11.17. <i>Swelling and nickel segregation around voids in electron-irradiated Fe–Cr–Ni alloys</i> , A. Hishinuma, Y. Katano and K. Shiraishi	1063
11.18. <i>The microstructure of rapidly solidified Path A Prime Candidate Alloys following irradiation with Fe and He ions</i> , L. Arnberg, J.B. Vander Sande, H.J. Frost and O.K. Harling	1069
11.19. <i>The influence of helium on the swelling behaviour by electron irradiation of a Mn–Cr austenitic stainless steel</i> , M. Snykers and E. Ruedl	1075
11.20. <i>The influence of fabrication procedure on the void swelling of an oxide dispersion strengthened ferritic alloy in a HVEM</i> , M. Snykers, F. Biermans and J. Cornelis	1079
11.21. <i>The microstructure of “triple-beam” ion irradiated Fe and Fe–Cr alloys</i> , L.L. Horton, J. Bentley and W.A. Jesser	1085
11.22. <i>Simulation irradiation studies on iron</i> , E. Kuramoto, N. Yoshida, N. Tsukuda, K. Kitajima, N.H. Packan, M.B. Lewis and L.K. Mansur	1091
11.23. <i>Effect of titanium on microstructural changes in SUS 316 stainless steels</i> , H. Kawanishi, M. Yamada, K. Fukuya and S. Ishino	1097
11.24. <i>Microstructure of rapidly solidified Path A Prime Candidate Alloys</i> , J. Megusar, L. Arnberg, J.B. Vander Sande and N.J. Grant	1103

11.25. <i>Microstructure of rapidly solidified Al₂O₃ dispersion strengthened type 316 stainless steel</i> , J. Megusar, L. Arnberg, J.B. Vander Sande and N.J. Grant	1109
11.26. <i>Pre-irradiation spatial distribution and stability of boride particles in rapidly solidified boron doped stainless steels</i> , N. Kanani, L. Arnberg and O.K. Harling	1115
11.27. <i>Void swelling and segregation of solute in ion-irradiated ferritic steels</i> , S. Ohnuki, H. Takahashi and T. Takeyama	1121
11.28. <i>Transformation and tempering behavior of 12 Cr–1 Mo–0.3 V martensitic stainless steel weldments</i> , J.C. Lippold	1127
11.29. <i>The effect of microstructure on the mechanical properties of a commercial 12 Cr–1 Mo steel (HT-9)</i> , T. Lechtenberg	1133
Section 12. Swelling and microstructure – non-ferrous metals	
12.1. <i>Void swelling the molybdenum alloy TZM irradiated to high fluence</i> , D.S. Gelles, D.T. Peterson and J.F. Bates	1141
12.2. <i>Effect of pulsed irradiation on void swelling in nickel</i> , J.L. Brimhall, L.A. Charlot and E.P. Simonen	1147
12.3. <i>The effect of alloying on helium bubble behaviour in refractory metals</i> , P.J. Goodhew, S.K. Tyler and M.B. Waldron	1151
12.4. <i>In-situ observation of void swelling in molybdenum alloys by means of high voltage electron microscopy</i> , N. Igata, A. Kohyama and S. Nomura	1157
12.5. <i>Swelling behavior of Mo–0.5 Ti and TZM bombarded with heavy ions at temperatures between 750 and 1450°C</i> , J.F. Stubbins and J. Moteff	1163
12.6. <i>Depth dependence of radiation hardening in 10 MeV ⁴He⁺ ion bombarded molybdenum</i> , K. Abe, A. Hasegawa, M. Kikuchi and S. Morozumi	1169
12.7. <i>Void coarsening during the annealing of neutron irradiated molybdenum</i> , N. Igata, K. Miyahara, K. Hakomori and H. Kayano	1175
12.8. <i>Room temperature precipitation of helium in molybdenum observed by TEM and THDS; helium platelet formation</i> , A. van Veen, L.M. Caspers and J.H. Evans	1181
12.9. <i>The influence of preimplanted helium on the microstructure of neutron irradiated vanadium</i> , W. van Witzenburg, A. Mastenbroek and J.D. Elen	1187
12.10. <i>Swelling of ⁵⁸Ni⁺ and ³He⁺ ion-irradiated Nb and Nb alloys</i> , B.A. Loomis and S.B. Gerber	1193
12.11. <i>The resistance of (Fe, Ni)₃V long-range-ordered alloys to neutron and ion irradiation</i> , D.N. Braski	1199
12.12. <i>Development of iron-base long-range ordered (LRO) alloys for fusion reactor first wall and blanket applications</i> , C.T. Liu	1205
12.13. <i>TEM-investigation of the microstructural evolution in simulation-irradiated Cu–Be alloys</i> , R. Koch, R.P. Wahi and H. Wollenberger	1211
12.14. <i>Fusion neutron disordering of Cu₃Au</i> , M.W. Guinan, J.H. Kinney, R.A. Van Konynenburg and A.C. Damask	1217
12.15. <i>Effects of high helium production rate on microstructural evolution in aluminium during 600 MeV proton irradiation</i> , W.V. Green, S.L. Green, B.N. Singh and T. Leffers	1221
12.16. <i>The irradiation of high purity and helium doped aluminum with aluminum ions</i> , S.K. McLaurin, G.L. Kulcinski and R.A. Dodd	1227
12.17. <i>Depth distribution of 20-keV helium ion irradiation induced cavities in nickel</i> , G. Fenske, S.K. Das and M. Kaminsky	1231
Section 13. Irradiation creep	
13.1. <i>A creep fracture model for irradiated and helium injected austenitic stainless steels</i> , S.S. Vagarali and G.R. Odette	1239
13.2. <i>Characteristics of irradiation creep in the first wall of a fusion reactor</i> , W.A. Coghlan and L.K. Mansur	1245
13.3. <i>Enhancement of irradiation creep in pulsed fusion reactors</i> , H. Gurol, N.M. Ghoniem and W.G. Wolfer	1251
13.4. <i>Irradiation creep by cascade-induced point defect fluctuations</i> , L.K. Mansur, W.A. Coghlan, T.C. Reiley and W.G. Wolfer	1257
13.5. <i>A theory of irradiation and thermal creep by dislocation climb</i> , R. Bullough, M.W. Finnis and M.H. Wood	1263
13.6. <i>The stress dependence of creep in Ni bombarded with 17 MeV deuterons</i> , C.H. Henager, Jr., E.P. Simonen, E.R. Bradley and R.G. Stang	1269
13.7. <i>Irradiation creep in simple binary alloys</i> , J. Nagakawa, V.K. Sethi and A.P.L. Turner	1275
13.8. <i>Pulsed irradiation creep in nickel</i> , E.P. Simonen and C.H. Henager, Jr.	1281

Section 14. Fundamental studies of radiation effects

14.1. <i>Fission-fusion correlations for swelling and microstructure in stainless steels: effect of the helium to displacement per atom ratio</i> , G.R. Odette, P.J. Maziasz and J.A. Spitznagel	1289
14.2. <i>Flow and fracture of alloys in the fusion environment</i> , W.G. Wolfer and R.H. Jones	1305
14.3. <i>Displacement cascades in diatomic materials</i> , D.M. Parkin and C.A. Coulter	1315
14.4. <i>Molecular dynamic calculations of energetic displacement cascades</i> , M.W. Guinan and J.H. Kinney	1319
14.5. <i>Computer simulation of high energy recoils in FCC metals: cascade shapes and sizes</i> , H.L. Heinisch	1325
14.6. <i>Exact calculations of nuclear recoil energies from prompt γ decays resulting from neutron capture</i> , J.H. Kinney	1331
14.7. <i>Characterisation of displacement cascade damage in Cu₃Au produced by fusion-neutron irradiation</i> , C.A. English, M.L. Jenkins and M.A. Kirk	1337
14.8. <i>The depth distribution of displacement damage in α-iron under "triple beam" ion irradiation</i> , L.L. Horton, J. Bentley and W.A. Jesser	1343
14.9. <i>Direct comparison of electron and self-ion damage in aluminum as a fusion-neutron simulation study</i> , T. Muroga, K. Fukuya, H. Kawanishi and S. Ishino	1349
14.10. <i>Effects of cascades on the evolution of irradiated structures in metals</i> , K. Kitajima, N. Yoshida and E. Kuramoto	1355
14.11. <i>A model based fission-fusion correlation of cavity swelling in stainless steel</i> , R.E. Stoller and G.R. Odette	1361
14.12. <i>On radiation-induced structural changes in stainless steel alloys</i> , W. Schüle and R. Scholz	1367
14.13. <i>Compositional change induced by ion bombardment on binary alloys</i> , K. Morita, H. Nakamura, M. Hayashibara and N. Itoh	1373
14.14. <i>Radiation induced segregation in candidate fusion reactor alloys</i> , J.L. Brimhall, D.R. Baer and R.H. Jones	1379
14.15. <i>In-situ observations of heavy-ion damage in stainless steel</i> , K. Fukuya, H. Kawanishi and S. Ishino	1385
14.16. <i>Trap theory of helium partitioning at low doses</i> , B.O. Hall	1391
14.17. <i>Dislocation sink strengths for the rate theory of irradiation damage</i> , R. Bullough and T.M. Quigley	1397
14.18. <i>The effect of precipitate-matrix interface sinks on the growth of voids in the matrix</i> , A.D. Brailsford and L.K. Mansur	1403
14.19. <i>The effect of cyclic pulsed temperature on void growth in metals during irradiation</i> , L.N. Kmetyk, W.F. Sommer and J. Weertman	1409
14.20. <i>Radiation-induced segregation at internal sinks in electron irradiated binary alloys</i> , H. Takahashi, S. Ohnuki and T. Takeyama	1415
14.21. <i>Point defect-edge dislocation rate constants and bias factors using lattice relaxation and Monte Carlo simulations</i> , R.H.J. Fastenau and M.I. Baskes	1421
14.22. <i>Recoil resolution and particle stability under irradiation</i> , H.J. Frost and K.C. Russell	1427
14.23. <i>Neutron source characterization for fusion materials studies</i> , L.R. Greenwood	1433
14.24. <i>Neutron environment in d+Li facilities</i> , F.M. Mann, F. Schmittroth and L.L. Carter	1439
14.25. <i>Spectral tailoring for fusion radiation damage studies: where do we stand?</i> T.A. Gabriel, R.A. Lillie, K. Thoms and R.L. Childs	1445
14.26. <i>Experimental helium generation cross sections for fast neutrons</i> , D.W. Kneff, B.M. Oliver, M.M. Nakata and H. Farrar IV	1451
14.27. <i>The interaction of helium and displacement damage in inertial confinement fusion reactors</i> , R.F. Schafer, Jr. and N.M. Ghoniem	1457
14.28. <i>Helium partitioning to extended defects in dual ion bombarded 304 and 316 SS</i> , J.A. Spitznagel, S. Wood, N.J. Doyle, W.J. Choyke, J.N. McGruer, J.R. Townsend and R.B. Irwin	1463
14.29. <i>An assessment of void nucleation by gas atoms during irradiation</i> , B.N. Singh and A.J.E. Foreman	1469
14.30. <i>Precipitation and cavity formation in austenitic stainless steels during irradiation</i> , E.H. Lee, A.F. Rowcliffe and L.K. Mansur	1475
14.31. <i>Ion irradiation mode effects on void formation</i> , M. Shimada and H. Kamei	1481

14.32. <i>Diffusion of alloy components under simulation irradiation</i> , M.-P. Macht, V. Naundorf and H. Wollenberger	1487
14.33. <i>Thermal diffusion of tritium in Nb metal</i> , M. Sugisaki, K. Idemitsu, S. Mukai and H. Furuya	1493
Section 15. Testing methods	
15.1. <i>Miniaturized fatigue crack growth specimen technology and results</i> , R.J. Puigh, R.E. Bauer, A.M. Ermi and B.A. Chin	1501
15.2. <i>An in situ fatigue crack propagation experiment</i> , A.M. Ermi and B.A. Chin	1505
15.3. <i>Fracture toughness testing on ferritic alloys using the electropotential technique</i> , F.H. Huang and G.L. Wire	1511
15.4. <i>An in situ mechanical-radiation effects test capsule for simulating fusion material environments</i> , K.E. Christensen, G.A. Bennett and W.F. Sommer	1517
15.5. <i>Miniature specimen tensile data for high energy neutron source experiments</i> , N.F. Panayotou, R.J. Puigh and E.K. Opperman	1523
15.6. <i>Microhardness tests for high energy neutron source experiments</i> , G.E. Lucas and N.F. Panayotou	1527
15.7. <i>Small scale ductility tests</i> , M. Dooley, G.E. Lucas and J.W. Sheckherd	1533
15.8. <i>Time-dependent flow properties from indentation tests</i> , G.E. Lucas and C. Pendleton	1539
15.9. <i>The development of a miniaturized disk bend test for the determination of postirradiation mechanical properties</i> , M.P. Manahan, A.S. Argon and O.K. Harling	1545
15.10. <i>Development of manufacturing methods for 50-cm diameter neutron source targets for RTNS-II</i> , C. Logan, J. Dini, W. Ludemann, B. Schumacher, E. Dalder, W. Kelley and G. Harter	1551
15.11. <i>FMIT test cell diagnostics – a unique materials challenge</i> , C.P. Cannon and J.L. Fuller	1557
15.12. <i>Instrumented in-reactor test capabilities in FFTF</i> , R.E. Bauer	1563
15.13. <i>Neutron irradiation facilities at the intense pulsed neutron source-I</i> , B. Brown and T. Blewitt	1567
15.14. <i>Accelerator component development for fusion material test device</i> , A. Miyahara, S. Kawasaki, Y. Kuboto, Z. Kabeya, T. Kunibe, N. Kobayashi and Y. Ukai	1573
15.15. <i>Simultaneous light ion irradiation and fatigue experiment for the ISPRa cyclotron</i> , D.G. Rickerby and P. Fenici	1577
15.16. <i>Use of the LAMPF accelerator as a fusion materials-radiation effects facility</i> , W.F. Sommer, L.N. Kmetyk, W.V. Green and R. Damjanovich	1583
15.17. <i>Effects of fusion neutrons on thermocouples</i> , C.M. Logan, D.W. Heikkinen, B.J. Schumacher and P.A. House	1589
15.18. <i>The measurement of water vapor permeability of glove materials using dilute tritiated water</i> , D.H. Doughty	1595
Author index	1601
Subject index	1614