



Contents

Preface	vii	Simulation of the kinetics of defect accumulation in copper under neutron irradiation, <i>H.L. Heinisch and B.N. Singh</i>	46
Committees and sponsors	ix	Atom transport efficiency in heavy ion irradiated metals, <i>P. Fielitz, V. Naundorf and H. Wollenberger</i>	52
Contents Parts C	xi	Subcascade formation in displacement cascade simulations: Implications for fusion reactor materials, <i>R.E. Stoller and L.R. Greenwood</i>	57
Part C		Defect cluster formation in vanadium irradiated with heavy ions, <i>N. Sekimura, Y. Shirao, H. Yamaguchi, S. Yonamine and Y. Arai</i>	63
Section 12. Radiation effects		High energy cascades in gold as studied by high energy self-ion irradiation, <i>N. Sekimura, Y. Kanzaki, N. Ohtake, J. Saeki, Y. Shirao, S. Ishino, T. Iwata, A. Iwase and R. Tanaka</i>	68
12.1. Damage production and accumulation		Radiation processing of powders for improved fusion structural materials, <i>Yu.A. Zaykin, B.A. Aliyev, B.P. Chesnokov and O.A. Kiryushatov</i>	73
Neutron energy spectrum and temperature effects on freely migrating defect concentrations and grain boundary segregation in α -Fe, <i>R.G. Faulkner, D.J. Bacon, S. Song and P.E.J. Flewitt</i>	1	12.2. Mechanical properties	
Diffuse X-ray scattering studies of radiation defects in Ni and dilute Ni alloys, <i>H. Yuya, H. Maeta, H. Ohtsuka, N. Matsumoto, H. Sugai, A. Iwase, T. Matsui, T. Suzuki, M. Jinchoh and K. Yamakawa</i>	7	Contribution to irradiation creep arising from gas-driven bubble growth, <i>C.H. Woo and F.A. Garner</i>	78
Radiation-induced amorphization and recrystallization of α -SiC single crystal, <i>K. Kawatsura, N. Shimatani, T. Igarashi, T. Inoue, N. Terazawa, S. Arai, Y. Aoki, S. Yamamoto, K. Narumi, H. Naramoto, Y. Horino, Y. Mokuno and K. Fujii</i>	11	Influence of irradiation on the dislocation kinetics with allowance for the dislocation velocity distribution, <i>N.V. Kamyshanchenko, V.V. Krasil'nikov, I.M. Nekliudov and A.A. Parkhomenko</i>	84
Radiation effects of 200 keV and 1 MeV Ni ion on MgO single crystal, <i>T. Mitamura, K. Kawatsura, R. Takahashi, T. Adachi, T. Igarashi, S. Arai, N. Masuda, Y. Aoki, S. Yamamoto, K. Narumi, H. Naramoto, Y. Horino, Y. Mokuno and K. Fujii</i>	15	Effect of size and configuration of 3-point bend bar specimens on <i>J-R</i> curves, <i>S. Jitsukawa, A. Naito and J. Segawa</i>	87
Radiation damage and radiation-induced segregation in single crystal stainless steel by RBS and PIXE channeling, <i>T. Mitamura, K. Kawatsura, T. Nakae, T. Igarashi, T. Inoue, S. Arai, Y. Aoki, S. Yamamoto, K. Narumi, H. Naramoto, Y. Horino, Y. Mokuno, K. Fujii, M. Terasawa, H. Uchida, K. Koterazawa, K. Takahiro, S. Nagata and S. Yamaguchi</i>	21	Properties of precipitation hardened steel irradiated at 323 K in the Japan materials testing reactor, <i>M. Niimi, Y. Matsui, S. Jitsukawa, T. Hoshiya, T. Tsukada, M. Ohmi, H. Mimura, N. Ooka and K. Hide</i>	92
Computer simulation of the interaction between an edge dislocation and interstitial clusters in Fe and Ni, <i>E. Kuramoto, K. Ohsawa, T. Tsutsumi and M. Koyanagi</i>	26	Effects of neutron irradiation on microstructure and mechanical properties of pure iron, <i>B.N. Singh, A. Horsewell and P. Toft</i>	97
TRANS_MU computer code for computation of transmutant formation kinetics in advanced structural materials for fusion reactors, <i>N.V. Markina and G.A. Shimansky</i>	30	Influence of post-irradiation thermal annealing on the mechanical properties of ion irradiated layers in 316L stainless steel, <i>C. Robertson, L. Boulanger and S. Poissonnet</i>	102
A molecular dynamics simulation study of displacement cascades in vanadium, <i>K. Morishita and T. Diaz de la Rubia</i>	35	Microstructure and mechanical properties of neutron irradiated TiNi shape memory alloy, <i>Y. Matsukawa, T. Suda, S. Ohnuki and C. Namba</i>	106
Formation mechanism of clustered small loops (rafts) in fission-neutron irradiated Mo at high temperatures, <i>K. Yamakawa and Y. Shimomura</i>	41	Microstructural examination of Ni-ion irradiated Fe-Ni-Cr alloys followed to micro-zone deformation, <i>M. Ando, Y. Katoh, H. Tanigawa and A. Kohyama</i>	111
		The influence of helium co-implantation on ion-induced hardening of low activation ferritic steel evaluated by	

micro-indentation technique, <i>Y. Katoh, H. Tanigawa, T. Muroga, T. Iwai and A. Kohyama</i>	115	Interaction of solutes with irradiation-induced defects of electron-irradiated dilute iron alloys, <i>H. Abe and E. Kuramoto</i>	209
Justification of the new approach to the testing of the candidate ITER materials in fission reactor, <i>V.A. Nikolaenko, V.I. Karpukhin, E.A. Krasikov and V.N. Kuznetsov</i>	120	Dynamical process of defect clustering in Ni under the irradiation with low energy helium ions, <i>K. Ono, K. Arakawa and N. Yoshida</i>	214
Strengthening, loss of strength and embrittlement of beryllium under high temperature neutron irradiation, <i>G.A. Sernyaev, A.V. Kozlov and V.R. Barabash</i>	123	Voids in fast-neutron-irradiated Cu, Ni and Cu–Ni concentrated alloys studied by TEM and positron annihilation methods, <i>H. Fukushima, K. Ochiai and Y. Shimomura</i>	220
The mechanical properties of 590 MeV proton irradiated iron, <i>Y. Chen, P. Spätig and M. Victoria</i>	128	Computer simulation on the void formation in neutron-irradiated Cu and Ni at high temperature, <i>Y. Shimomura, I. Mukouda and K. Sugio</i>	225
Defect structure development in a pure iron and dilute iron alloys irradiated with neutrons and electrons, <i>A. Okada, H. Maeda, K. Hamada and I. Ishida</i>	133	Damage evolution in neutron-irradiated Cu during neutron irradiation, <i>I. Mukouda and Y. Shimomura</i>	230
Irradiation examination of CuNiCrSi alloy for ITER applications, <i>A.D. Ivanov, A.V. Kozlov, M.V. Chernetsov and S.A. Averin</i>	139	Defect accumulation behavior in iron irradiated with energetic ions and electrons at ~80 K, <i>Y. Chimi, A. Iwase and N. Ishikawa</i>	236
Mechanical property changes of low activation ferritic/martensitic steels after neutron irradiation, <i>Y. Kohno, A. Kohyama, T. Hirose, M.L. Hamilton and M. Narui</i>	145	Disordering kinetics of Ni ₃ Al under ion irradiation, <i>S. Müller, C. Abromeit, S. Matsumura, N. Wanderka and H. Wollenberger</i>	241
Postirradiation thermocyclic loading of ferritic–martensitic structural materials, <i>L. Belyaeva, A. Orychtchenko, C. Petersen and V. Rybin</i>	151	Modelling of dissolution profiles of ordered particles under irradiation, <i>C. Abromeit, E. Camus and S. Matsumura</i>	246
Mechanical properties and microstructure of advanced ferritic–martensitic steels used under high dose neutron irradiation, <i>V.K. Shamardin, V.N. Golovanov, T.M. Bulanova, A.V. Povstianko, A.E. Fedoseev, Yu.D. Goncharenko and Z.E. Ostrovsky</i>	155	Dynamical phase changes induced by point defect fluxes under irradiation, <i>C. Abromeit and G. Martin</i>	251
Irradiation hardening of V–4Cr–4Ti, <i>E.V. van Osch and M.I. de Vries</i>	162	Invisible and visible point defect clusters in neutron irradiated iron, <i>M. Horiki, T. Yoshiie, M. Iseki and M. Kiritani</i>	256
Post-irradiation mechanical properties of austenitic alloys at temperatures below 703 K, <i>S. Jitsukawa, I. Ioka and A. Hishinuma</i>	167	Void formation close to stacking fault tetrahedra in heavily electron irradiated pure Ag and Cu, <i>K. Niwase, F. Phillipp, W. Sigle and A. Seeger</i>	261
Post-irradiation creep rupture properties of FBR grade 316 SS structural material, <i>N. Miyaji, Y. Abe, S. Ukai and S. Onose</i>	173	An analysis of void swelling dose dependence in ion irradiated V–Fe alloys, <i>V.A. Pechenkin, Yu.V. Kono-beev, S.I. Rudnev and G.A. Epov</i>	266
Evaluation of weld crack susceptibility for neutron irradiated stainless steels, <i>T. Suzuki, A. Kohyama, T. Hirose and M. Narui</i>	179	The effect of the solute atomic size on the swelling of vanadium alloys, <i>V.A. Borodin and A.I. Ryazanov</i>	270
12.3. Microstructural evolution		Atomic mechanisms and energetics of thermally activated processes of helium redistribution in vanadium, <i>V.M. Chernov, V.A. Romanov and A.O. Krutskikh</i>	274
Defect-flow-induced heterogeneous dislocation formation and solute redistribution near a grain boundary in austenitic stainless steel under electron irradiation, <i>S. Watanabe, N. Sakaguchi, S. Mochizuki and H. Takahashi</i>	184	Structural change in graphite under electron irradiation at low temperatures, <i>M. Takeuchi, S. Muto, T. Tanabe, H. Kurata and K. Hojou</i>	280
Electron irradiation effects on Ti–Ni shape memory alloys, <i>A. Okada, K. Hamada, T. Matsumoto, I. Ishida and Y. Abe</i>	189	TEM analyses of surface ridge network in an ion-irradiated graphite thin film, <i>S. Muto, T. Tanabe, M. Takeuchi, Y. Kobayashi, S. Furuno and K. Hojou</i>	285
Annealing of Cu ₃ Au irradiated with protons, α -particles and C ions at liquid nitrogen temperature, <i>H. Sakairi, E. Yagi and A. Koyama</i>	194	Microstructural evolution and radiation stability of steels and alloys, <i>V.N. Voyevodin, I.M. Neklyudov, V.V. Bryk and O.V. Borodin</i>	290
High-resolution electron microscopy of γ -TiAl irradiated with 15 keV helium ions at room temperature, <i>M. Song, K. Furuya, T. Tanabe and T. Noda</i>	200	Destination of point defects and microstructural evolution under collision cascade damage, <i>T. Yoshiie and M. Kiritani</i>	296
MD study of the dynamic behavior of small interstitial clusters in Fe, <i>M. Koyanagi, K. Ohsawa and E. Kuramoto</i>	205	Microstructural evolution and hardening of neutron irradiated vanadium alloys at low temperatures in Japan Material Testing Reactor, <i>Y. Candra, K. Fukumoto, A. Kimura and H. Matsui</i>	301
		Surface morphology and void formation in 316L stainless steel irradiated with high energy C-ions, <i>Z.G. Wang, K.Q. Chen, L.W. Li, C.H. Zhang, J.M. Quan</i>	

<i>M.D. Hou, R.H. Xu, F. Ma, Y.F. Jin, C.L. Li and Y.M. Sun</i>	306	Section 13. Breeding blanket materials, plasma facing materials and high heat flux materials (II)	
Effect of solute concentration on grain boundary migration with segregation in stainless steel and model alloys, <i>H. Kanda, N. Hashimoto and H. Takahashi</i>	311	Development of tritium permeation barriers on Al base in Europe, <i>G. Benamati, C. Chabrol, A. Perujo, E. Rigal and H. Glasbrenner</i>	391
Microstructures of type 316 model alloys neutron-irradiated at 513 K to 1 dpa, <i>Y. Miwa, T. Tsukada, H. Tsuji and H. Nakajima</i>	316	Calculation and experimental investigation of fusion reactor divertor plate and first wall protection by capillary-pore systems with lithium, <i>V.A. Evtikhin, I.E. Lyublinski, A.V. Vertkov, V.G. Belan, I.K. Konkashbaev and L.B. Nikandrov</i>	396
12.4. H, He effects and temperature transient effects		Properties of lithium metatitanate pebbles produced by a wet process, <i>J.G. van der Laan and R.P. Muis</i>	401
Effects of He implantation on radiation induced segregation in Cu–Au and Ni–Si alloys, <i>A. Iwase, L.E. Rehn, P.M. Baldo and L. Funk</i>	321	The use of liquid metals in porous materials for divertor applications, <i>L.I. Ivanov, S.A. Maslyayev, V.N. Pimenov, E.V. Dyomina and Yu.M. Platov</i>	405
Observation of spatial distribution of tritium in zirconium alloy with microautoradiography, <i>K. Isobe, Y. Hatano, M. Sugisaki, T. Hayashi, M. Nishi and K. Okuno</i>	326	Be–Cu joints based on amorphous alloy brazing for divertor and first wall application, <i>B. Kalin, V. Fedotov, O. Sevryukov, A. Plyushev, I. Mazul, A. Gervash and R. Giniatulin</i>	410
Trapping of deuterium by niobium at eV ion bombardment energies, <i>A.A. Evanov, V.A. Kurnaev, D.V. Levchuk and A.A. Pisarev</i>	330	Dependence of deuterium line-shape on the insertion depth of BN and C limiters in the TPE-1RM20 reversed field pinch plasma, <i>S. Sekine, Y. Hirano, T. Shimada, Y. Yagi and H. Sakakita</i>	415
Behavior of ion-implanted helium and structural changes in nickel-base alloys under long-time exposure at elevated temperatures, <i>I.I. Chernov, B.A. Kalin, A.N. Kalashnikov and V.M. Ananin</i>	333	Deuterium retention in codeposited layers and carbon materials exposed to high flux D-plasma, <i>I.I. Arkhipov, A.E. Gorodetsky, R.Kh. Zalavutdinov, A.P. Zakharov, T.A. Burtseva, I.V. Mazul, B.I. Khripunov, V.V. Shapkin and V.B. Petrov</i>	418
Radiation-induced segregation of deuterium in austenitic steels and vanadium alloys, <i>V.L. Arbutov, G.A. Raspopova and V.B. Vykhodets</i>	340	Microstructure and impact properties of ultra-fine grained tungsten alloys dispersed with TiC, <i>Y. Kitsumai, H. Kurishita, H. Kayano, Y. Hiraoka, T. Igarashi and T. Takida</i>	423
Investigation of palladium alloy properties degradation during long-time tritium exposure, <i>V. Tebus, L. Rivkis, G. Arutunova, E. Dmitrievsky, V. Filin, Y. Golikov, V. Krivova and V. Kapychev</i>	345	Fracture toughness of copper-base alloys for fusion energy applications, <i>D.J. Alexander, S.J. Zinkle and A.F. Rowcliffe</i>	429
Neutronics aspects of a DHCE experiment, <i>I.C. Gomes, H. Tsai and D.L. Smith</i>	349	The method design, manufacture and tests of the porous beryllium mock-ups for the ITER breeding blanket, <i>D.A. Davydov, M.I. Solonin, Yu.E. Markuchkin, V.A. Gorokhov and V.V. Gorlevsky</i>	435
Physical mechanisms of helium release during deformation of vanadium alloys doped with helium atoms, <i>A. Ryazanov, H. Matsui and A.V. Kazaryan</i>	356	Section 14. Structural materials (II), insulators (II) and others	
Effects of varying temperature irradiation on the neutron irradiation hardening of reduced-activation 9Cr–2W martensitic steels, <i>R. Kasada, A. Kimura, H. Matsui, M. Hasegawa and M. Narui</i>	360	Modeling of the cyclic ball indentation test for small specimens using the finite element method, <i>T. Yamamoto, H. Kurishita and H. Matsui</i>	440
Effect of temperature change on microstructural evolution of vanadium alloys under neutron irradiation in JMTR, <i>N. Nita, K. Fukumoto, A. Kimura and H. Matsui</i>	365	Tensile and impact behaviour of BATMAN II steels, Ti-bearing reduced activation martensitic alloys, <i>G. Filacchioni, E. Casagrande, U. De Angelis, G. De Santis, D. Ferrara and L. Pilloni</i>	445
Effect of temperature change on void swelling in P, Ti-modified 316 stainless steel, <i>N. Akasaka, K. Hattori, S. Onose and S. Ukai</i>	370	Influence of helium on impact properties of reduced-activation ferritic/martensitic Cr-steels, <i>R. Lindau, A. Möslang, D. Preininger, M. Rieth and H.D. Röhrig</i>	450
Microstructural evolution in vanadium irradiated during ion irradiation at constant and varying temperature, <i>K. Ochiai, H. Watanabe, T. Muroga, N. Yoshida and H. Matsui</i>	376	Influence of thermal aging on tensile and impact bending properties of the steel grades OPTIFER and F82H mod., <i>L. Schäfer and M. Schirra</i>	455
Fluence dependence of defect evolution in austenitic stainless steels during fission neutron irradiation, <i>H. Watanabe, T. Muroga and N. Yoshida</i>	381	Study of oxygen influence on vanadium product for fusion structural materials, <i>X. Hui, W. Yan, L. Ansheng, H. Xue and W. Lijun</i>	459
Triple ion beam studies of radiation damage in 9Cr–2WVTa ferritic/martensitic steel for a high power spallation neutron source, <i>E.H. Lee, J.D. Hunn, G.R. Rao, R.L. Klueh and L.K. Mansur</i>	385		

Corrosion of some V- and Nb-base alloys under irradiation in water, <i>V.A. Kazakov, V.P. Chakin and Yu.D. Goncharenko</i>	463	15.2. Plasma material interactions	
Development of a reaction-sintered silicon carbide matrix composite, <i>A. Sayano, C. Sutoh, S. Suyama, Y. Itoh and S. Nakagawa</i>	467	Plasma-facing materials mixing and mixed material properties	526
Influence of neutron irradiation on deformability and fracture micromechanisms of titanium α -alloys, <i>O.A. Kozhevnikov, E.V. Nesterova, V.V. Rybin and I.I. Yarmolovich</i>	472	15.3. Design and materials	
ITER Materials R&D Data Bank, <i>S. Tanaka, R. Matera, G. Kalinin, V. Barabash and K. Mohri</i>	478	The role of materials R&D in the development of commercial fusion power plants, <i>J.W. Davis</i>	532
Present status of Data-Free-Way (distributed database system for advanced nuclear materials), <i>H. Tsuji, N. Yokoyama, M. Fujita, Y. Kurihara, S. Kano, Y. Tachi, K. Shimura, R. Nakajima and S. Iwata</i>	486	Summary of discussion session: Design and materials, <i>A. Kohyama, E.E. Bloom and K. Ehrlich</i>	538
Evaluation of magnetic fields due to the ferromagnetic vacuum vessel and their influence on plasma discharge in tokamak devices, <i>T. Nakayama, M. Abe, T. Tadokoro and M. Otsuka</i>	491	15.4. Damage production and accumulation	
Radiation-induced electrical and optical processes in materials based on Al_2O_3 , <i>O.A. Plaskin, V.A. Stepanov, P.A. Stepanov and V.M. Chernov</i>	496	Damage production and accumulation	540
Superconducting transition in Nb_3Ge irradiated by neutrons in the superconducting state, <i>L.S. Topchishvili and T.Sh. Kvirikashvili</i>	502	15.5. Common technology and knowledge sharing	
Critical current in NbTi wires irradiated by neutrons at 20 K, <i>L.S. Topchishvili and A.I. Naskidashvili</i>	505	Common technologies and knowledge sharing	553
Manufacturing technique of Nb_3Al super-conductive sheet by electrically heated powder rolling, <i>C. Mochizuki and M. Mikami</i>	508	15.6. Ceramics	
Research progress of fusion materials in CIAE, <i>J. Yu and C. Shan</i>	512	Irradiation effects in ceramics for fusion reactor applications, <i>T. Shikama, K. Yasuda, S. Yamamoto, C. Kinoshita, S.J. Zinkle and E.R. Hodgson</i>	560
		15.7. ITER and beyond	
		ITER and beyond	569
		15.8. Materials R&D strategies in the next decade	
		Materials research and development strategy in the next decade	578
		Author index Part C	583
		Subject index Part C	591
Section 15. Discussion sessions			
15.1. Low activation materials			
Low activation materials, <i>R.H. Jones, H.L. Heinisch and K.A. McCarthy</i>	518		