

| | |
|---|-----|
| Lithium-vandium experimental facility for blanket problems investigation, <i>V.A. Evtikhin, I.E. Lyublinski, A.V. Vertkov and V.M. Korjavin</i> | 731 |
| Flow balancing in liquid metal blankets, <i>M.S. Tillack and N.B. Morley</i> | 735 |
| Author Index of Parts A, B and C | 743 |

CONTENTS OF PART B

V. Divertors and Plasma-Facing Components

INVITED PAPER

| | |
|---|---|
| High quality actively cooled plasma-facing components for fusion, <i>R.E Nygren</i> | 3 |
|---|---|

CONTRIBUTED PAPERS

| | |
|---|-----|
| High Z limiter test in TEXTOR: thermal response and post-mortem analysis, <i>T. Tanabe, Y. Ueda, V. Philippss, B. Unterberg, A. Pospieszczyk, B. Schweer and M. Fujine</i> | 13 |
| Design, fabrication and testing of a helium cooled module, <i>C.B. Baxi, J. Smith and D. Youchison</i> | 22 |
| An assessment of disruption erosion in the ITER environment, <i>A. Hassanein and I. Konkashbaev</i> | 27 |
| Design, materials and R&D issues of innovative thermal contact joints for high heat flux applications, <i>G. Federici, R. Matera, S. Chiocchio, J. Dietz, G. Janeschitz, D. Driemeyer, J. Haines, M.S. Tillack and M. Ulrickson</i> | 34 |
| Detection of subcooled boiling heat transfer regimes up to critical heat flux by accelerometric equipment, <i>G.P. Celata, G. Dell'Orco and G.P. Gaspari</i> | 44 |
| Critical heat flux multiplier of subcooled flow boiling for non-uniform heating conditions in a swirl tube, <i>F. Inasaka and H. Nariai</i> | 53 |
| Mechanisms for extreme heat transfer conditions in water-cooling of fusion reactor components, <i>B.M. Lekakh, J.E. Meyer and M.S. Kazimi</i> | 59 |
| Numerical simulation of heat transfer and fluid flow of a non-equilibrium argon plasma jet with confined wall, <i>T. Kunugi, K. Ezato, T. Yokomine and A. Shimizu</i> | 63 |
| Evaluation of cooling concepts and specimen geometries for high heat flux tests on neutron irradiated divertor elements, <i>J. Linke, M. Akiba, M. Araki, H. Bolt, G. Breitbach, R. Duwe, K. Nakamura and J.H. You</i> | 72 |
| Two-dimensional impinging jet cooling of high heat flux surfaces in magnetic confinement fusion reactors, <i>A. Inoue, T. Tanno, M. Takahashi and Y. Yamasaki</i> | 81 |
| Thermal cycling and isothermal tests on black-coated specimens, <i>B. Windelband, K. Kleefeldt, D. Munz and B. Schinke</i> | 90 |
| Thermomechanical study of a new concept for a beryllium-protected high heat flux component, <i>M. Merola, R. Matera, G. Federici and S. Chiocchio</i> | 97 |
| Thermomechanical investigation on divertor supports for fusion experimental reactor: hydraulic experimental results, <i>T. Arai, R. Hino, Y. Muto, M. Nakahira, M. Shibui, K. Furuya, E. Tada and M. Seki</i> | 103 |
| Assessing braze quality in the actively cooled Tore Supra phase III outboard pump limiter, <i>R.E. Nygren, T.L. Lutz, J.D. Miller, R. McGrath and G.E. Dale</i> | 113 |

| | |
|---|-----|
| Application of amorphous filler metals in production of fusion reactor high heat flux components, <i>B.A. Kalin, V.T. Fedotov, A.E. Grigoriev, O.N. Sevriukov, A.N. Pliushev, L.A. Skuratov, V.I. Polsky, V.L. Yakushin, Yu.S. Virgiliev, V.L. Vasiliev and S.S. Tserevitinov</i> | 119 |
| Impact of surface phenomena in metals on hydrogen isotope permeation, <i>M. Yamawaki, N. Chitose, V. Bandurko and K. Yamaguchi</i> | 125 |
| Coating effect on plasma-driven permeation of hydrogen in iron, <i>W.M. Shu and Y. Hayashi</i> | 131 |
| Tritium retention in candidate next-step protection materials: engineering key issues and research requirements, <i>G. Federici, R. Causey, P.L. Andrew and C.H. Wu</i> | 136 |
| Vacuum UV spectroscopy of armor erosion from plasma gun disruption simulation experiments, <i>P.D. Rockett, J.A. Hunter, J.T. Bradley, III, J.M. Gahl, A. Zhitlukhin, K. Arkhipov, V. Bakhtin, D. Toporkov, I. Ovchinnokov, V.E. Kuznetsov and V.A. Titov</i> | 149 |
| Experimental simulation of plasma high heat flux–materials interaction during ITER disruption, <i>V.M. Kozhevin, V.N. Litunovsky, B.V. Ljublin, I.B. Ovchinnikov, V.A. Titov, A.A. Drozdov and V.E. Kuznetsov</i> | 157 |
| Numerical simulation of strong evaporation and condensation for plasma-facing materials, <i>T. Kunugi and H. Yasuda</i> | 162 |
| Erosion yield of graphite and B ₄ C irradiated by high flux deuterium beams, <i>M. Isobe, Y. Ohtsuka, H. Shinonaga, Y. Ueda, B. Kyoh and M. Nishikawa</i> | 170 |
| Estimates of the effect of a plasma momentum flux on the free surface of a thin film of liquid metal, <i>N.B. Morley, A.A. Gaizer and M.A. Abdou</i> | 176 |

VI. Tritium Recovery and Tritium Fuel Cycle

INVITED PAPERS

| | |
|---|-----|
| Tritium handling and processing experience at the Tritium Systems Test Assembly, <i>J.L. Anderson and K. Okuno</i> | 183 |
| Tritium/hydrogen barrier development, <i>G.W. Hollenberg, E.P. Simonen, G. Kalinin and A. Terlain</i> | 190 |
| Operation of the tokamak fusion test reactor tritium systems during initial tritium experiments, <i>J.L. Anderson, C. Gentile, M. Kalish, J. Kamperschroer, T. Kozub, P. LaMarche, H. Murray, A. Nagy, S. Raftopoulos, R. Rossmassler, R. Sissingh, J. Swanson, F. Tulipano, M. Viola, D. Voorhees and R.T. Walters</i> | 209 |

CONTRIBUTED PAPERS

| | |
|---|-----|
| Estimation of the tritium production and inventory in beryllium, <i>S. Shimakawa, H. Sagawa, T. Kuroda, T. Suzuki, H. Kawamura, H. Takatsu and M. Saito</i> | 215 |
| Tritium recovery from lithium, based on a cold trap, <i>D.-K. Sze, R.F. Mattas, J. Anderson, R. Haange, H. Yoshida and O. Kveton</i> | 220 |
| Tritium recovery from liquid metals, <i>H. Moriyama, S. Tanaka, D.K. Sze, J. Reimann and A. Terlain</i> | 226 |
| Progress in tritium retention and release modeling for ceramic breeders, <i>A.R. Raffray, M.C. Billone, G. Federici and S. Tanaka</i> | 240 |
| Tritium permeation barriers for fusion technology, <i>A. Perujo and K.S. Forcey</i> | 252 |
| Operation of a simulated non-steady tokamak fuel loop using the tritium systems test assembly, <i>S. Konishi, Y. Yamanishi, M. Enoda, T. Hayashi, S. O'Hira, M. Yamada, T. Suzuki, K. Okuno, R.H. Sherman, R.S. Willms, D.J. Taylor, R.V. Carlson, J.E. Nasise, J.W. Barnes, J.R. Bartlit and J.L. Anderson</i> | 258 |

| | |
|---|-----|
| Analysis of tritium transport in irradiated beryllium, <i>S. Cho and M.A. Abdou</i> | 265 |
| Changes in the microstructure and density of Li ₂ O during irradiation in BEATRIX II, phase I, <i>T. Takahashi, K. Noda, O.D. Slagle and F.D. Hobbs</i> | 271 |
| Analysis of tritium extraction from liquid lithium by permeation window and solid gettering process, <i>T. Takeda, A. Ying and M.A. Abdou</i> | 278 |
| Modeling of surface reaction in tritium release from lithium ceramics and its comparison with transient experiments, <i>D. Yamaki, S. Tanaka and M. Yamawaki</i> | 286 |
| Luminescence observation from lithium oxide under neutron irradiation, <i>S. Tanaka, D. Yamaki, M. Yamawaki, T. Miyamura and R. Kiyose</i> | 292 |
| Analysis of tritium behaviour and recovery from a water-cooled Pb17Li blanket, <i>C. Malara, G. Casini and A. Viola</i> | 299 |
| TIARA analysis of tritium inventory in Li ₂ O, <i>M.C. Billone</i> | 313 |
| Conceptual study of the cryocascade for pumping, separation and recycling of ITER torus exhaust, <i>A. Mack and D. Perinic</i> | 319 |
| The Analytical glove-box in the tritium magazine of ETHEL, <i>U. Engelmann and G. Vassallo</i> | 324 |
| Time-dependent tritium inventories and flow rates in fuel cycle components of a tokamak fusion reactor, <i>W. Kuan, M.A. Abdou and R.S. Willms</i> | 329 |
| Membrane pumping technology for helium and hydrogen isotope separation in the fusion reactor, <i>V.I. Pistunovich, A.Yu. Pigarov, A.O. Busnyuk, A.I. Livshits, M.E. Notkin, A.A. Samartsev, K.L. Borisenko, V.V. Darmogray, B.D. Ershov, L.V. Filippova, B.G. Mudugin, V.N. Odintsov, G.L. Saksagansky and D.V. Serebrennikov</i> | 336 |
| Fuel cycle design for SEA FP project, <i>D.K. Murdoch, P. Dinner, K. Kalyanam and R. Carr</i> | 341 |
| Development of fusion fuel cycle technology at the Tritium Laboratory Karlsruhe: the experiment CAPRICE, <i>M. Glugla and R.D. Penzhorn</i> | 348 |
| Tritium evacuation performance of a large oil-free reciprocating pump, <i>T. Hayashi, M. Yamada, S. Konishi, Y. Matsuda, K. Okuno, J.E. Nasise, R.S. Dahlin and J.L. Anderson</i> | 357 |
| Absorption and desorption of hydrogen from inert gas mixtures with a Zr ₃ Al ₂ particle bed, <i>N. Mitsuishi, S. Sato and S. Fukada</i> | 362 |
| Efficient HTO reduction using a Zr–Fe–Mn alloy, <i>F. Ghezzi, W.T. Shmayda, N. Venkataramani and G. Bonizzoni</i> | 367 |
| Sorbent materials for fusion reactor tritium processing, <i>F. Toci, A. Viola, R.A.H. Edwards, T. Mencarelli and V. Forcina</i> | 373 |
| Tritium sorption by cement and subsequent release, <i>F. Ono, S. Tanaka and M. Yamawaki</i> | 378 |
| Practical-scale tests of cryogenic molecular sieve for separating low-concentration hydrogen isotopes from helium, <i>R.S. Willms, D.J. Taylor, M. Enoeda and K. Okuno</i> | 386 |
| The role of sidestream recycle in hydrogen isotope separation and column cascade design, <i>R.H. Sherman, D.J. Taylor, T. Yamanishi, M. Enoeda, S. Konishi and K. Okuno</i> | 392 |
| Performance of a palladium membrane reactor using an Ni catalyst for fusion fuel impurities processing, <i>R.S. Willms, R. Wilhelm and S. Konishi</i> | 397 |
| On order reduction in hydrogen isotope distillation models, <i>D.A. Sarigiannis</i> | 406 |

VII. Shielding, Neutronics and Nuclear Data

| | |
|---|-----|
| Radioactivity measurements of ITER materials using the TFTR D–T neutron field, <i>A. Kumar, M.A. Abdou, C.W. Barnes, H.W. Kugel and M.J. Loughlin</i> | 415 |
| Shielding analysis for the ITER divertor and vacuum-pumping ducts, <i>M.E. Sawan, Y. Gohar and R. Santoro</i> | 429 |
| FENDL data testing for beryllium, lead, iron and copper, <i>U. Fischer and E. Wiegner</i> | 437 |
| Nuclear data for fusion: a view from two meetings, <i>F.M. Mann and E.T. Cheng</i> | 446 |

| | |
|--|-----|
| Experiment and analysis of induced radioactivity in large SS-316 stainless steel shielding material bombarded with 14 MeV neutrons, <i>Y. Ikeda, C. Konno, F. Maekawa, Y. Uno, Y. Oyama, K. Kosako and J. Maekawa</i> | 449 |
| Quantification of design margins and safety factors based on the prediction uncertainty in tritium production rate from fusion integral experiments of the USDOE/JAERI collaborative program on fusion blanket neutronics, <i>M.Z. Youssef, A. Kumar, M.A. Abdou, Y. Oyama, C. Konno, F. Maekawa, Y. Ikeda, K. Kosako, M. Nakagawa, T. Mori and H. Maekawa</i> | 457 |
| Summary of experiments and analysis from the JAERI/USDOE Collaborative Program on Fusion Blanket Neutronics, <i>H. Maekawa and M.A. Abdou</i> | 479 |
| Characterization of TFTR shielding penetrations of ITER relevance in D-T neutron field, <i>A. Kumar, M.A. Abdou and H.W. Kugel</i> | 492 |
| The bulk shielding benchmark experiment at the Frascati Neutron Generator (FNG), <i>P. Batistoni, M. Angelone, M. Martone, M. Pillon, V. Rado, A. Santamarina, I. Abidi, B. Gastaldi, M. Martini, J.P. Marquette</i> | 504 |
| Radiation shielding analysis of a large helical device, <i>H. Handa, K. Hayashi, H. Yamanishi, Y. Sakuma, H. Kaneko, H. Obayashi, O. Motojima, Y. Ogawa, K. Yamada and T. Abe</i> | 515 |
| Pre-evaluation of fusion shielding benchmark experiment, <i>K. Hayashi, H. Handa, C. Konno, F. Maekawa, H. Maekawa, K. Maki, K. Yamada and T. Abe</i> | 525 |
| Measurements of tokamak fusion test reactor D-T radiation shielding efficiency, <i>H.W. Kugel, G. Ascione, S. Elwood, J. Gilbert, L.-P. Ku, J. Levine, K. Rule, N. Azziz, P. Goldhagen, F. Hajnal and P. Shebell</i> | 534 |
| Experimental investigation of neutron and photon penetration and streaming through iron assemblies, <i>H. Freiesleben, W. Hansen, D. Richter, K. Seidel and S. Unholzer</i> | 545 |
| Neutronics and shielding results of the US International Thermonuclear Experimental Reactor blanket trade-off study, <i>M.E. Sawan and L.A. El-Guebaly</i> | 551 |
| Cost-effectiveness of new polynated materials for shielding against fusion neutrons, <i>Y. Karni and E. Greenspan</i> | 559 |
| Study of fusion shielding neutronics in experiments with an assembly containing voids, <i>S.A. Konakov, D.V. Markovskij, A.N. Svetchkopal, D.Y. Chuwilin, K. Turek and F. Spurni</i> | 566 |
| Radioactivity computation of steady state and pulsed fusion reactor operation, <i>H. Attaya</i> | 571 |
| Pulsed activation analyses of the ITER blanket design options considered in the blanket trade-off study, <i>Q. Wang and D.L. Henderson</i> | 579 |
| Activation analyses for the different options considered in the US ITER blanket trade-off study, <i>H.Y. Khater</i> | 589 |
| Measurements of D-T neutron induced radioactivity in plasma-facing materials and their role in qualification of activation cross-section libraries and codes, <i>A. Kumar, Y. Ikeda, M.A. Abdou, M.Z. Youssef, C. Konno, K. Kosako, Y. Oyama, T. Nakamura and H. Maekawa</i> | 596 |
| Characterization of nuclear transmutations in materials irradiation test facilities, <i>I.C. Gomes and D.L. Smith</i> | 610 |
| Comparison of three-dimensional neutronics calculations for a fusion breeder with large channels, <i>J.H. Huang, ZH.Y. Xie, CH.L. You and D.V. Markovskij</i> | 618 |
| Benchmark analyses of the ENDF/B-VI, EFF-1 and EFF-2 beryllium data evaluations for neutron transport calculations, <i>U. Fischer and E. Wiegner</i> | 624 |
| Effect of selection of calculation parameters in discrete ordinate code DOT3.5 for analyses of fusion blanket integral experiments in JAERI-USDOE collaborative program, <i>Y. Oyama, K. Kosako, C. Konno, Y. Ikeda, F. Maekawa and H. Maekawa</i> | 636 |

| | |
|--|-----|
| Neutronic performance of two European breeder-inside-tube (BIT) blankets for DEMO: the helium-cooled ceramic LiAlO ₂ with Be multiplier and the water-cooled liquid Li ₁₇ Pb, <i>L. Petrizzi and V. Rado</i> | 642 |
| Analytical formulae for estimating damage rate in the final mirrors of laser inertial fusion energy reactors based on the uncollided neutron flux, <i>M.Z. Youssef and A. Kumar</i> | 648 |
| Neutronics assessment for the ARIES advanced reactor studies, <i>L.A. El-Guebaly</i> | 658 |
| Nuclear analysis for the inertially confined direct drive laser fusion power reactor SIRIUS-P, <i>M.E. Sawan</i> | 665 |
| Evaluation of the prediction uncertainty in tritium production based on results from experiments on an Li ₂ O annular blanket surrounding a 14 MeV simulated line source, <i>M.Z. Youssef, M.A. Abdou, A. Kumar, K. Kosako, Y. Oyama, F. Maekawa, Y. Ikeda,</i> <i>C. Konno and H. Maekawa</i> | 673 |
| Characterization of the source neutrons produced by the Frascati Neutron Generator, <i>M. Pillon, M. Angelone, M. Martone and V. Rado</i> | 683 |
| Conceptual design of neutron diagnostic systems for fusion experimental reactor, <i>T. Iguchi,</i> <i>J. Kaneko, M. Nakazawa, T. Matoba, T. Nishitani and S. Yamamoto</i> | 689 |
| Calorimetric measurements of nuclear heating in small probes of plasma-facing materials, <i>A. Kumar, Y. Ikeda, M.A. Abdou, M.Z. Youssef, C. Konno, K. Kosako, Y. Oyama,</i> <i>T. Nakamura and H. Maekawa</i> | 699 |
| Integral experiment of effects of large opening in fusion reactor blanket on tritium breeding using annular geometry, <i>C. Konno, Y. Oyama, F. Maekawa, Y. Ikeda, K. Kosako,</i> <i>H. Maekawa, M.A. Abdou, A. Kumar and M.Z. Youssef</i> | 708 |
| Measurement techniques for fusion blanket neutronics experiments, <i>Y. Oyama, C. Konno,</i> <i>Y. Ikeda, F. Maekawa, H. Maekawa, S. Yamaguchi, K. Tsuda, T. Nakamura, M.A.</i> <i>Abdou, E.F. Bennett, R.F. Mattas, K.G. Porges and M.Z. Youssef</i> | 716 |
| Neutronics of a D-Li neutron source. An overview, <i>I.C. Gomes and D.L. Smith</i> | 724 |
| Radiological dose calculations for the particle beam fusion accelerator upgrade (PBFA-U), <i>H.Y. Khater and M.E. Sawan</i> | 730 |
| Measurements of 14 MeV neutron multiplication in spherical beryllium shells, <i>U. von</i> <i>Möllendorff, A.V. Alevra, H. Giese, F. Kappler, H. Klein and R. Tayama</i> | 737 |
| Benchmark experiment on copper with D-T neutrons for verification of neutron transport and related nuclear data of JENDL-3.1, <i>C. Konno, F. Maekawa, Y. Oyama, Y. Ikeda</i> <i>and H. Maekawa</i> | 745 |
| Benchmark experiment on copper with D-T neutrons for verification of secondary gamma-ray data in JENDL-3.1, <i>F. Maekawa, Y. Oyama, C. Konno, Y. Ikeda and</i> <i>H. Maekawa</i> | 753 |
| Validation and improvement of Fe, Cr, Ni nuclear data in bulk shield benchmark experiments, <i>A. Santamarina, I. Abidi and B. Gastaldi</i> | 762 |
| Integral test of Kerma data for SS-304 stainless steel in the D-T fusion neutron environment, <i>Y. Ikeda, A. Kumar, K. Kosako, C. Konno, Y. Oyama, F. Maekawa,</i> <i>M.Z. Youssef, M.A. Abdou and H. Maekawa</i> | 769 |
| Author Index of Parts A, B and C | 777 |