

About This Publication and the JAEA Organizational Outline	10
--	----

1 Research and Development Related to the Accident at the TEPCO's Fukushima Daiichi NPS

Highlight Assistance in Environmental Restoration and Decommissioning	13
--	----

1-1 Evaluation of Uranium Leaching from Fuel Debris in Water – Leaching Rate Evaluation Considering Effects of Concrete Components, and Comparison with Spent Fuel – Akira Nakayoshi	14
1-2 Distribution of Components in Fuel Debris – Segregation of Gadolinium and Iron during Solidification Using Simulated Molten Debris – Ayako Sudo	15
1-3 50x Increase in Plasma Emission Intensity by Microwave – Advanced Remote Analysis Technology for Fuel Debris Using Laser-Induced Breakdown Spectroscopy – Masaki Oba	16
1-4 Clarifying the Warming Behavior of a Robot Test Pool – Measurement and Analysis toward Facility Utilization with User Needs – Ryoki Arakawa	17
1-5 3D Reconstruction of Structures from Images – Development of Image Analysis Method to Support Remote Operation – Toshihide Hanari	18
1-6 Chemisorption of Cesium on Structural Materials during SA – Prediction and Verification of Thermodynamic Properties of Cesium Compounds – Chikashi Suzuki	19
1-7 Hydrogen Release from Geopolymer by Gamma Irradiation – Reduced Hydrogen Yield of Bulky, Solidified, Water-Saturated Waste – Isao Yamagishi	20
1-8 Accident Progression Analysis: Units 1–3 at the Fukushima Daiichi NPS – Insights from International Benchmark Analysis Project – Hitoshi Tamaki	21
1-9 Cause of Cesium Concentration Change in Fish – Three Transport Pathways from Forests to Fish – Hiroshi Kurikami	22
1-10 Fast and Easy Analysis of Tritium in Plants and Animals – Development of Rapid Organically Bound Tritium (OBT) Analysis in Marine Products – Kenso Fujiwara	23
1-11 How Does the Dose Rate Change after Decontamination? – Effects of Land Use Type Revealed from Long-Term Monitoring Data – Shigeo Nakama	24
1-12 Radiocesium Behavior in River System – Relationship between Mineral Species and Radiocesium in Riverbed Using Microscopy – Hiroki Hagiwara	25

1-13	Cause of Radioactivity Concentration in Mushrooms – Cesium Selectivity Evaluation of Mushroom Pigment Norbadione A – Hiroya Suno	26
1-14	Estimation of Total Radiocesium Discharged from Fukushima Daiichi NPS to the Coast – Discharge Inventory Decreased to Approximately 1/100000 th Since the Accident – Susumu Yamada	27
1-15	Reconstruction of Atmospheric Release and Dispersion of Radioactive Materials by Computer Simulation – Contribution to the Refinement of Dose Assessment in the Early Stage of the Accident by Improving the Dispersion Calculation Optimization Method – Hiroaki Terada	28
1-16	Initial Air Dose Rate after the Accident at the Fukushima Daiichi NPS – Comparison between Fukushima and Chernobyl – Kazuya Yoshimura	29
1-17	Analyzing Decreasing Trends in Radioactivity and Dose Rate – Changes of Radiocesium Concentration in Soil and Air Dose Rate over Five Years – Satoshi Mikami	30
1-18	Assessment of External Exposure Doses in Daily Life – Development of Assessment Model Based on Local Radiation Surveys – Shogo Takahara	31

2 Research on Nuclear Safety and Emergency Preparedness

Highlight	Implementing Continuous Improvements in Safety and Emergency Preparedness	32
2-1	Measurement of Very Thin Liquid Film Thickness – Technical Development for the Evaluation of Liquid Film Dryout Behavior – Yuki Wada	33
2-2	Reliable Safety Evaluation for Reactivity-Initiated Accidents – Mechanical Property Evaluation of Fuel Cladding under Biaxial Stress Conditions – Takeshi Mihara	34
2-3	Effects of Stress on Oxidation near a Crack Tip – Toward an Understanding of the Mechanism of Environmentally-Assisted Cracking in Stainless Steel – Kuniki Hata	35
2-4	Preparing for Aftershocks After a Major Earthquake – Proposal of Risk Assessment Method Considering Large Aftershocks – Byunghyun Choi	36
2-5	Elucidating HEPA Filter Clogging under Organic Solvent Fire – Development of Severe Accident Assessment Method for Reprocessing Facilities – Takuya Ono	37
2-6	Rapidly and Widely Measuring Radiation from the Sky – Preparedness for Using Aerial Radiation Monitoring during a Nuclear Emergency – Akira Futemma	38

3

Advanced Scientific Research

Highlight

Advanced Science Pioneers the Future 39

3-1

Observing Giant Dipole Vibration in Fission Fragments– Toward Understanding the Fission Process –
Hiroyuki Makii

40

3-2

Improving the Extraction Efficiency by Preventing Aggregation Phenomena of a Complex– Development of a Solvent Extraction Method Using the Strong Hydrophobicity of Fluorine –
Yuki Ueda

41

3-3

Clarifying the Mechanism behind Superconductivity in Uranium Compounds– NMR Research to Reveal the Mechanism of Spin-Triplet Superconductivity –
Yo Tokunaga

42

3-4

Detection of the Singularity of Magnets Using Rotation– Measuring the Angular Momentum Compensation, Key to Speeding Up Magnetic Devices –
Masaki Imai

43

3-5

Closing in on the Longstanding Puzzle of Localized Electrons in an Electron-Conducting Oxide– Using Muons to Unveil the Nature of Localized Electrons in Hydrogen-Doped SrTiO₃ –
Takashi Ito

44

3-6

Revealing Unique Nucleus Shapes by Nuclear Reactions– Cluster Structure and Its Probability –
Kazuki Yoshida

45

4

Nuclear Science and Engineering Research

Highlight

Fundamental Technologies for Nuclear Energy Innovation 46

4-1

Development of Photonuclear Data Library for International Contribution– Accomplishment of a Reliable Database Supporting the Use of Photonuclear Reactions –
Nobuyuki Iwamoto

47

4-2

Development of Nuclear Data for LLFP Transmutation– Models to Predict the Nuclear Cross-Section of Long-Lived Fission Products (LLFPs) –
Futoshi Minato

48

4-3

Accelerated Corrosion of Low-Alloy Steel at the Air/Solution Interface– Clarification of Corrosion Acceleration Mechanism from Structural Analysis of Rust Layer –
Kyohei Otani

49

4-4

Extension of Applicable Range of ESR Dosimetry via Enamel Separation Techniques– External Exposure Dose Estimation of Wild Japanese Macaque in Fukushima Prefecture –
Toshitaka Oka

50

4-5	Real-Time Estimation of Radiation Dose at Flight Altitudes – Development of Warning System for Aviation Exposure to Solar Energetic Particles (SEPs) – Tatsuhiko Sato	51
4-6	Separation of Minor Actinides Using Incinerable Extractants – Recovery of Minor Actinides and Rare Earth Elements in a Concrete Cell – Yasutoshi Ban	52
4-7	Validation of Nuclear Design Accuracy for ADS – Critical Experiment with Plutonium Fuel – Akito Oizumi	53
4-8	Development of Beam Window Materials for ADSs – Post-Irradiation Examination of Beam Window Materials through International Project – Shigeru Saito	54

5 Applied Neutron and Synchrotron Radiation Research and Development

Highlight	Contributions to Developments in Science, Technology, and Academic Research	55
------------------	---	----

5-1	Toward Upgrading High-Intensity Proton Accelerators – A Radio Frequency Quadrupole Linac Using a New Beam Dynamics Design Scheme – Yasuhiro Kondo	56
5-2	Detection of Change in Hydrogen Bond in the Deep Earth – Direct Observation of Symmetrization at High Pressure by Neutron Diffraction – Asami Sano	57
5-3	Mitigation of Damage to the Target Vessel Wall – Enabled High-Power Spallation Neutron Target by Double-Walled Structure – Takashi Naoe	58
5-4	Enabling Material Analysis with Neutron Beams at Manufacturing Sites – Texture Measurement of Steel Materials Using a Compact Neutron Source – Pingguang Xu	59
5-5	Elucidation of Structural Fluctuations of Proteins – Observation of Structure and Dynamics of Protein by Neutron Scattering – Hiroshi Nakagawa	60
5-6	Structural Analysis of Ionic Liquid–Electrode Interface – Nano-Scale Analysis of the Interfacial Structure Using a Quantum Beam – Kazuhisa Tamura	61
5-7	Toward Next-Generation Memory with Low Power Consumption – Observation of Electronic Structure of Alumina Film for Nonvolatile Memory – Masato Kubota	62
5-8	Observation of Electrons in Unconventional Uranium Superconductor – First Observation of the Electronic Structure of UTe_2 – Shin-ichi Fujimori	63

6

HTGR Hydrogen and Heat Application Research

Highlight

Research and Development on HTGR, Hydrogen Production, and Heat Application Technologies 64

6-1	Whole Core Burnup Characteristic Evaluation Method Using Representative Impurities – Cost Reduction for HTGRs Using Inexpensive Graphite Materials – Shoichiro Okita	65
6-2	A Threefold Increase in Burnup of HTGR Fuel – Development on High-Burnup HTGR Fuel under International Cooperation – Koei Sasaki	66
6-3	Toward Harmonization with Renewable Energy – HTGR Concept for Accomplishing Hybrid Operation with Renewable Energy – Hiroyuki Sato	67
6-4	Toward Commercial Implementation of the IS Process with HTGRs for Hydrogen Production – Development of Strength Evaluation Method for Ceramic Structures – Hiroaki Takegami	68
6-5	Toward Metallic Sulfuric Acid Decomposers in the IS Process – Development of a Corrosion Test Apparatus without Sulfur Dioxide (SO ₂) Leakage – Noriaki Hirota	69
6-6	Toward Stable and Continuous Hydrogen Production by the IS Process – Development of a Pump Shaft Seal Technology for HI Solution Including Highly Concentrated I ₂ – Hiroki Noguchi	70
6-7	Impact of Exhaust Stack Collapse on the Reactor Building – Confirmation of the Integrity of the Reactor Building by 3D Model Collision Analysis – Masato Ono	71

7

Research and Development of Fast Reactors

Highlight

Enhancing the Ability of Research and Development 72

7-1	Toward Efficient Manufacturing of the Above-Core Structure – Routing Study of the Above-Core Structure with a Mock-Up Experiment – Kazuya Takano	73
7-2	Reliable Decay Heat Removal by Natural Convection – Core Cooling Experiment Using Dipped DHX and Development of Evaluation Method – Toshiki Ezure	74
7-3	Development of Fuel Assembly Analysis Method in Fast Reactors – Prediction of Thermal Hydraulics in Fuel Assembly with Inner Duct Structure (FAIDUS) – Norihiro Kikuchi	75

7-4	Development of Ultra-High Temperature Tolerant Fuel Claddings – Mechanical Properties of Oxide Dispersion Strengthened Steel Claddings at 1000 °C – Yasuhide Yano	76
7-5	Exploring an Ignition Mechanism of Hydrogen with Burning Sodium Mist – Visualizing the Ignition Process of Hydrogen Jets Containing Mist Caused by Sodium Leaks in Severe Accidents – Daisuke Doi	77

8 Research and Development on Fuel Reprocessing, Decommissioning, and Radioactive Waste Management

Highlight	Toward Decommissioning Nuclear Facilities and Managing Radioactive Waste	78
8-1	Toward Public Use of the Decommissioning Cost Estimation Code DECOST – Development of a Manual for the DECOST – Nobuo Takahashi	80
8-2	Radioactive Waste Confirmation Method for Rational Disposal – Study on the Evaluation Methodology of Wastes Generated from Post-Irradiation Examination Facilities – Akina Mitsukai	81
8-3	Complex Biological Effect of Low-Dose Radiation – Feature Extraction of Multidimensional Data Using Machine Learning – Norie Kanzaki	82
8-4	Radioactive Liquid Waste Management Technologies – STRAD Project for the Treatment of Radioactive Liquid Waste-Containing Chemicals – Sou Watanabe and Haruka Aihara	83
8-5	Assessing Underground Fracture Connectivity from the Surface – Development of a Single Borehole Investigation Method – Eiichi Ishii	84
8-6	Change in Permeability after Backfilling a Research Tunnel – Change in Hydraulic Conductivity in the Simulated Realistic Disposal Environment – Nobukatsu Miyara	85
8-7	Chemical Signatures Suggesting Recent Fault Activity – Detection of Elemental Changes due to Fault Activity – Masakazu Niwa	86
8-8	Visualization of Long-Term Variability in Groundwater Flow Conditions – Development of Evaluation Method for Variability of Groundwater Flow Conditions – Hironori Onoe	87
8-9	Mechanical Modeling of Buffer Materials – Applicability of Elasto-Plastic Constitutive Model under Saltwater Conditions – Yusuke Takayama	88

8-10	Unveiling the Interaction Mechanism of Fe (II) and Si – Characterization of Ferrous Silicate Co-Precipitates under Reducing Conditions – Paul Clarence M. Francisco	89
-------------	--	----

8-11	Analysis of Radioactive Samples by Plasma Generated in the Microchannel – Determination of Cesium in Highly Radioactive Liquid Waste by Liquid Electrode Plasma Optical Emission Spectrometry – Noriyasu Kodaka	90
-------------	--	----

9

Computational Science and E-Systems Research

Highlight	Computational Science for Nuclear Research and Development	91
------------------	--	----

9-1	CFD Simulation of a Fuel Debris Air-Cooling Experiment – Validation of a Thermal-Hydraulic Model Using the Lattice Boltzmann Method – Naoyuki Onodera	92
------------	--	----

9-2	Using Computer Simulations to Design a Superconducting Neutron Microscope – Simulating All Radiation Types inside the Neutron Microscope and Predicting Its Behavior – Alex Malins	93
------------	---	----

9-3	Understanding the Deformation of Iron from the Movement of Atoms – Analysis of Screw-Dislocation Motion and Slip-Plane Transition by Atomistic Simulations – Tomoaki Suzudo	94
------------	--	----

9-4	Multi-Phase Fluid Simulations Using the World's Largest GPU Supercomputer – Development of Communication-Avoiding Matrix Solvers on GPU – Yasuhiro Idomura	95
------------	---	----

10

Development of Science & Technology for Nuclear Nonproliferation

Highlight	Development of Technology and Human Capacity Building in the Nuclear Nonproliferation and Nuclear Security Fields to Support the Peaceful Use of Nuclear Energy	96
------------------	---	----

10-1	Nondestructive Assay of Nuclear Materials for Safeguards – Developing Practical Delayed Gamma-ray Spectroscopy Using PUNITA – Tomoki Yamaguchi and Douglas Chase Rodriguez	97
-------------	---	----