



# Contents

## Innovation Toward Effective LWR Spent Fuel Management with Superior Safety Characteristics: Prototype Gen IV Sodium-Cooled Fast Reactor

### Invited Articles

Overall System Description and Safety Characteristics of Prototype Gen IV Sodium Cooled Fast Reactor in Korea <i>Jaewoon Yoo, Jinwook Chang, Jae-Yong Lim, Jin-Sik Cheon, Tae-Ho Lee, Sung Kyun Kim, Kwi Lim Lee, and Hyung-Kook Joo</i> .....	1059
A Preliminary Safety Analysis for the Prototype Gen IV Sodium-Cooled Fast Reactor <i>Kwi Lim Lee, Kwi-Seok Ha, Jae-Ho Jeong, Chi-Woong Choi, Taekyeong Jeong, Sang June Ahn, Seung Won Lee, Won-Pyo Chang, Seok Hun Kang, and Jaewoon Yoo</i> .....	1071
On the Safety and Performance Demonstration Tests of Prototype Gen-IV Sodium-Cooled Fast Reactor and Validation and Verification of Computational Codes <i>Jong-Bum Kim, Ji-Young Jeong, Tae-Ho Lee, Sungkyun Kim, Dong-Jin Euh, and Hyung-Kook Joo</i> .....	1083
Metal Fuel Development and Verification for Prototype Generation IV Sodium-Cooled Fast Reactor <i>Chan Bock Lee, Jin Sik Cheon, Sung Ho Kim, Jeong-Yong Park, and Hyung-Kook Joo</i> .....	1096

### Original Articles

#### Reactor Physics

Effect of DUPIC Cycle on CANDU Reactor Safety Parameters <i>Nader M.A. Mohamed and Alya Badawi</i> .....	1109
Investigating Dynamic Parameters in HWZPR Based on the Experimental and Calculated Results <i>Zahra Nasrazadani, Manochehr Behfarnia, Jamshid Khorsandi, and Mohammad Mirvakili</i> .....	1120
Implementation of Strength Pareto Evolutionary Algorithm II in the Multiobjective Burnable Poison Placement Optimization of KWU Pressurized Water Reactor <i>Rahman Gharari, Navid Poursalehi, Mohammadreza Abbasi, and Mahdi Aghaie</i> .....	1126

#### Thermal Hydraulics

Simulation of Containment Pressurization in a Large Break-Loss of Coolant Accident Using Single-Cell and Multicell Models and CONTAIN Code <i>Omid Noori-Kalkhoran, Amir Saied Shirani, and Rohollah Ahangari</i> .....	1140
Experimental Investigation of the Thermal Hydraulics in Lead Bismuth Eutectic-Helium Experimental Loop of an Accelerator-Driven System <i>Wenxuan Xi, Yongwei Wang, Xunfeng Li, Xiulan Huai, and Jun Cai</i> .....	1154
Modeling of Hydrodynamic Processes at a Large Leak of Water into Sodium in the Fast Reactor Coolant Circuit <i>Sergey Perevoznikov, Yuriy Shvetsov, Aleksey Kamayev, Ilia Pakhomov, Viacheslav Borisov, Gennadiy Pazin, Oleg Mirzeabasov, and Olga Korzun</i> .....	1162

#### Nuclear Safety

Investigation of a Hydrogen Mitigation System During Large Break Loss-Of-Coolant Accident for a Two-Loop Pressurized Water Reactor <i>Mehdi Dehjourian, Reza Sayareh, Mohammad Rahgoshay, Gholamreza Jahanfarnia, and Amir Saied Shirani</i> .....	1174
---	------





# Contents

---

## Nuclear I&C

- Transient Diagnosis and Prognosis for Secondary System in Nuclear Power Plants  
*Sangjun Park, Jinkyun Park, and Gyunyoung Heo* .....1184
- Field Programmable Gate Array Reliability Analysis Using the Dynamic Flowgraph Methodology  
*Phillip McNelles and Lixuan Lu*.....1192
- Development of Highly Reliable Power and Communication System for Essential Instruments Under Severe Accidents in NPP  
*Bo Hwan Choi, Gi Chan Jang, Sung Min Shin, Soo Ill Lee, Hyun Gook Kang, and Chun Taek Rim* .....1206
- Computer Modeling, Characterization, and Applications of Gallium Arsenide Gunn Diodes in Radiation Environments  
*Wafaa Abd El-Basit, Safaa Mohamed El-Ghanam, Ashraf Mosleh Abdel-Maksood, Sanaa Abd El-Tawab Kamh, and Fouad Abd El-Moniem Saad Soliman* .....1219

## Radiation Protection

- Experimental Investigation of Clay Fly Ash Bricks for Gamma-Ray Shielding  
*Harjinder Singh Mann, Gurdarshan Singh Brar, Kulwinder Singh Mann, and Gurmel Singh Mudahar* .....1230

## Nuclear Structural Analysis and Plant Management & Maintenance

- Potentiality of Using Vertical and Three-Dimensional Isolation Systems in Nuclear Structures  
*Zhiguang Zhou, Jenna Wong, and Stephen Mahin*.....1237
- Numerical Ductile Tearing Simulation of Circumferential Cracked Pipe Tests under Dynamic Loading Conditions  
*Hyun-Suk Nam, Ji-Soo Kim, Ho-Wan Ryu, Yun-Jae Kim, and Jin-Weon Kim* .....1252
- Estimation of Leak Rate Through Cracks in Bimaterial Pipes in Nuclear Power Plants  
*Jai Hak Park, Jin Ho Lee, and Young-Jin Oh*.....1264

## Technical Notes

### Nuclear Safety

- Validation of a New Design of Tellurium Dioxide-Irradiated Target  
*Aziz Fllaoui, Younes Ghamad, Brahim Zoubir, Zinel Abidine Ayaz, Aissam El Morabiti, Hafid Amayoud, and El Mahjoub Chakir* .....1273

### Nuclear I&C

- Estimation of Probability Density Functions of Damage Parameter for Valve Leakage Detection in Reciprocating Pump Used in Nuclear Power Plants  
*Jong Kyeom Lee, Tae Yun Kim, Hyun Su Kim, Jang-Bom Chai, and Jin Woo Lee* .....1280

---

This journal was supported by the Korean Federation of Science and Technology Societies Grant funded by the Korean Government (MEST).

