# CONTENTS


CHAPTER 1. INTRODUCTION 1

CHAPTER 2. AFTERHEAT REMOVAL IN MODULAR GAS-COOLED REACTORS 3

2.1. AFTERHEAT REMOVAL UNDER ACCIDENT CONDITIONS 3
2.2. OTHER ASPECTS OF AFTERHEAT REMOVAL 4
- 2.2.1. Afterheat Removal Systems Performance During Normal Operation and Shutdown
- 2.2.2. System Failure and Recovery
- 2.2.3. System Design and Licensing

CHAPTER 3. MODEL VALIDATION AND CODE TO CODE BENCHMARK EXERCISES 7

3.1. VGM RCCS MOCKUP 7
- 3.1.1. Description of the Benchmark
- 3.1.2. Analysis of Benchmark Problem Defined on VGM Reactor Results
- 3.1.3. Analysis of VGM Reactor Cavity Cooling System Benchmark Problem With the Moreca Code
- 3.1.4. Results of Calculations of the VG RCCS benchmark
- 3.1.5. Comparison and Conclusions on VGM Reactor Cavity Cooling System Benchmark Problem

3.2. HTTR ANALYSIS OF HEAT UP ACCIDENTS 34
- 3.2.1. Description of HTTR Analysis of heat up accidents
- 3.2.2. Analysis of HTR Heat Up Accidents with the GRSAC Code
- 3.2.3. Results of Calculations of HTTR Heat Up Accidents
- 3.2.4. Analysis of HTTR Heat Up Accidents with the THYDE-HTGR Code
- 3.2.5. Comparison and Conclusions

3.3. HTR-10 ANALYSIS OF HEAT UP ACCIDENTS 64
- 3.3.1. Benchmark Problem Definition on HTR-10
- 3.3.2. Analysis of the HTR-10 Heat Up Accidents with the TAC-NC Code
- 3.3.3. Analysis of Benchmark Problems defined on HTR-10
- 3.3.4. Comparison and Conclusion of HTR-10 Benchmark Problems

3.4. GT-MHR PLUTONIUM BURNER 104
- 3.4.1. CRP-3 Benchmark Problem Description for GT-MHR BURNER Accidents
- 3.4.2. Analysis of Benchmark problem for GT-MHR Burner Heat Up Accidents
- 3.4.3. CASTEM model of GT-MHR Plutonium Burner Benchmark
- 3.4.4. Results of the GT-MHR Benchmark with the CFX Code
- 3.4.5. INET Analysis of the GT-MHR Plutonium Burner Benchmark Problem
- 3.4.6. Results of GT-MHR Plutonium Burner Benchmark Calculations
- 3.4.7. Comparison and conclusions

CHAPTER 4. CODE TO EXPERIMENT BENCHMARK EXERCISES 185

4.1. HTTR RCCS Mockup 185
- 4.1.1. Description of the GTTR RCCS Mockup and Benchmark Data
- 4.1.2. Results of Simulation of the HTTR RCCS Mockup with the TRIO-EF CASTEM 2000 Code
- 4.1.3. Results of Solution of the HTTR Reactor Cavity Cooling System

4.1.4. Calculations of the HTTR Reactor Cavity Cooling System
4.1.5. Analysis of HTTR Reactor Cavity Cooling System Benchmark Problem with the MORECA Code
4.1.6. Analysis of HTTR Reactor Cavity Cooling System Benchmark Problem with the Fidap-Code
4.1.7. Results of Simulation of the HTTR RCCS Mockup with the THANPACST2 Code
4.1.8. Comparison and conclusions

4.2. THE SANA-1 EXPERIMENTS FOR SELF-ACTING REMOVAL OF THE AFTERHEAT FROM A PEBBLE BED 296

4.2.1. SANA-1 Code to Experiment Summary Description of the Benchmark
4.2.2. INET Analysis of SANA-1 Experiment Benchmark Problems
4.2.3. TRIO-EF Model of SANA-1 Experimental Set-up
4.2.4. Numerical Simulation of the SANA-1 Experiments with the TINTE-Code
4.2.5. Comparison and Conclusions of the SANA Benchmark

APPENDICES 335

A.1. DETAILED EXPERIMENTAL DATA SETS FOR THE BENCHMARKS 335
A.1.1. SANA-1
A.1.2. OKBM Experimental Facilities for testing of HTGRs Components

A.2. CODE DESCRIPTION 350
A.2.1. Description of the CEA TRIO-EF Code
A.2.2. Description of the VGM, DUPT, SM1 and GTAS Codes
A.2.3. The ORNL GRSAC Code for Gas-cooled Reactor Simulations
A.2.4. CFX-F3D

Participants and Contributors to Drafting and Review 371