

MELCOR

PHEBUS-FPT2

Preliminary Calculation of PHEBUS-FPT2 Experiment Using MELCOR

305-303

MELCOR1.8.4
PHEBUS-FPT-2

Cadarache

2 kg

가

9000

가

, 2.3 kg

가

Iodine

87 %가

RCS

가 4.3 %

CORSOR-Booth

가

가

Abstract

This study shows preliminary analysis results on PHEBUS FPT-2 experiment, which has been performed in the frame of international cooperative research program by Cadarache research center in France using the MELCOR1.8.4 code. The objectives of this study are to validate whether the steam starvation in the upper part of the core occurs and whether the 2 kg of UO₂ can be melted or not under the scheduled steam injection rate and the power history. The prediction on the distribution of the fission product over the circuit is the additional objective. From this simulation, the steam starvation phenomena occurred at 9000 seconds and 2.3 kg of fuel was melted. Though 87 % of initial iodine inventory was released from the core. Only 4.3 % arrived at the containment. It was due to the increased deposition rate by the significantly reduced flow rate during the steam starvation period. According to the sensitivity study using the various release models in MELCOR, there are no

(Iodine, Ba, Mo)

가

MELCOR1.8.4

Iodine

(hygroscopic)

가 ,

II

II.1

PHEBUS FPT-2

1

18

sump

20 ,

Ag-In-Cd

20

, 2

가

Thoria,

가 , Zr

, 가 ,

Inconel

FPT-2

[3]

가

1.5 %

가 2400 K

Zr

UO₂ ZrO₂

Eutectic

[4] 2800K

pellet

3100 K

pellet

Inconel

eutectic

16

, 16

CsI , Iodine

Cs

CsI

가

PHEBUS FPT-2

Xe, Cs, Ba, I, Te

0.005, 0.003, 0.00005, 0.003, 0.001

가

가

1173 K

CORSOR

CORSOR Te 3 1173 K, 1673 K ,
 2473 K (CsI)
 가 [5]

II.2 Base
 Base

CORSOR

4000 6500 가
 (1173 K)
 , 가 가 6500 7500 가
 (1800K) 9500
 , 가 가 Zr UO₂
 , 가 2400K 9500 12000
 , 가 2
 가 가
 가 12000
 , 0.35m 3000K
 , 2.3 kg
 UO₂ , Eutectic
 가 가 3 FPT-2 80
 g 가

CORSOR 3
 4 Iodine 1173. K ,
 Iodine CsI 7000
 1673 K
 8500 9100
 가
 CsI 가 2473 K 3
 Ba, Mo 82% 가
 가,
 23%, 12% 가

가 FPT-1 , 가 9000 800 5 .
 , CsI 가 ,
 , CsI . 1 Iodine
 Iodine 4.3 % 가 FPT-0 FPT-1
 , FPT-0 60 %, FPT-1 55 % Iodine [6].

II.3

가
 , CORSOR, CORSOR-M Iodine ,
 . FPT-2 CORSOR-Booth
 . 가
 가 .
 CORSOR 3 . CORSOR-
 M CORSOR-BT .
 CORSOR, CORSOR-M 87 % .
 , 80 % , .
 CORSOR-BT 52 % . 6
 .
 가 ,
 가 .
 . 7 .

III

9000
 , 2.3 kg 가 .
 Iodine 87 % 가 , 4.3 % 가
 CsI .

CORSOR-Booth

가

가

가

가가

C (1)

가 가

FPT-2

가

FPT-0

FPT-1

가

Iodine

Iodine

IV

1. J.H.Park, H.D.Kim," Calculation on the PHEBUS FPT0 Using MELCOR ", PHEBUS FP 5th Bundle Interpretation Circle meeting, Aix-en provence, 1995,10.10.
2. S.W.Cho, J.H.Park, H.D.Kim," Post Test Analysis of the PHEBUS FPT1 Experiment ", , vol 31 number1, pp 88-103, 1999.
3. "PHEBUS FP Data Book FPT2 ", IPSN CEA, June 1998, TG 359.
4. D.L. Hagrman, "Materials Properties Model For Zirconium-Uranium Oxygen Melting, (PSOL, PLIQ), Solution, and Precipitation (ZUSOLV), EG&G Idaho, July 1985.
5. "MELCOR Computer Code Manuals: Reference Guide",NUREG/CR-6119, Vol.1 & 2, July 1997.
6. Y. Drossinos,"PHEBUS FP minutes of the 28th SAWG Meeting",ISPRA, March 1998.

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Iodine

| | Iodine (deposition) * |
|---------|-----------------------|
| | 22.5 % |
| | 11 % |
| | 16 % |
| C-point | 9.7 % |
| | 8 % |
| G-point | 9.9 % |
| | 4.9 % |

*

Iodine

그림 1 PHEBUS FPT-2 실험 모의 위한 MELCOR 코드 구역화

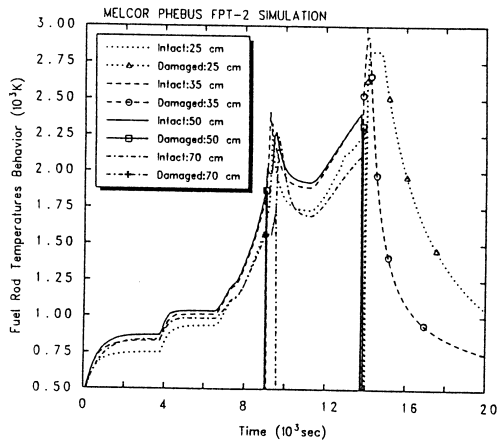
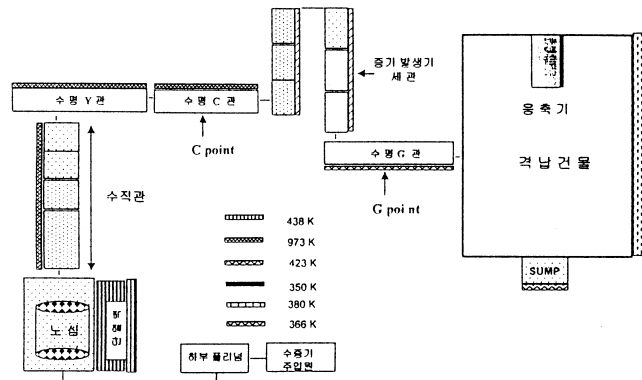


그림 2 핵연료봉 온도 변화

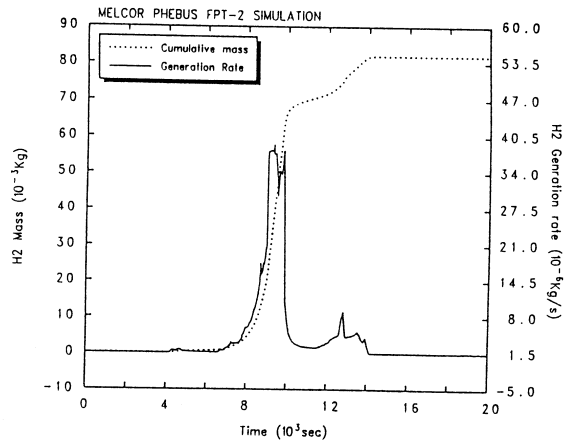


그림 3 총 수소 발생양

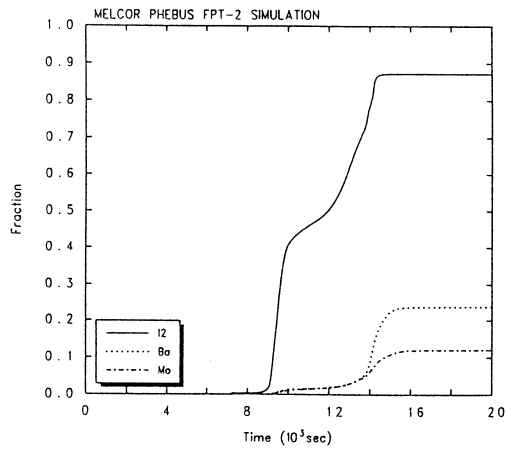


그림 4 시간에 따른 I₂, Ba, Mo 방출량

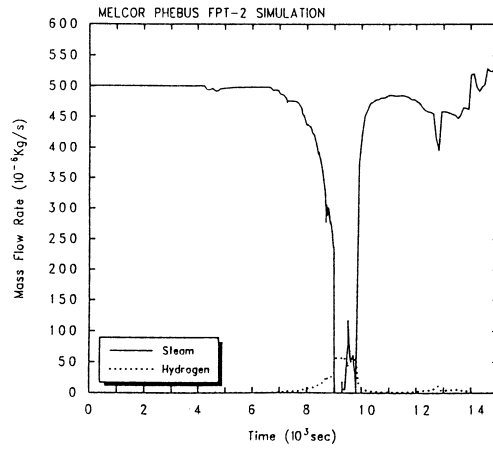


그림 5 노심 상단 출구 에서의 수증기 유동율

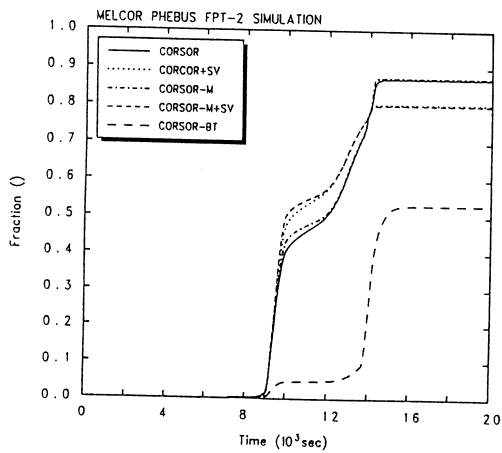


그림 6 방출 모델별 Iodine 방출 예측량

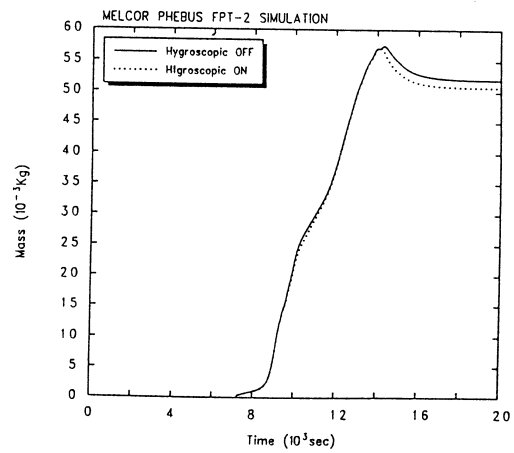


그림 7 흡습모델 적용에 따른 격납건물내 에어로졸 질량 변화