

2000

**DUPIC**  
**The HANALO irradiation test of the DUPIC fuel rod**

150

DUPIC  
1 rig 가 zircaloy - 4  
rig  
가  
DUPIC rig  
OR4 2000 5 2

**Abstract**

The irradiation test of DUPIC fuel, which was fabricated in the domestic at first has been performed. For the this objectives of this irradiation test, we redesigned for the non - instrumented irradiation rig that was used at the first irradiation test, and developed remote assembly devices for the DUPIC rig. Also we fabricated irradiation fuel rod using laser welding on the zircaloy - 4 cladding and endcap. And sound tests were carried out on the welding parts, DUPIC rig was assembled by remote operation at hot cell. Finally the irradiation test of DUPIC fuel has been performed successfully at HANAL OR4 hole for months from May 2000 after HANALO safety analysis.

1.

가

(DUPIC : Direct use of spent PWR fuel in CANDU reactors)

가 1991 5

DUPIC

가

[1].

DUPIC

가 1

DUPIC

rig

DUPIC

1

OR4

1999

8 4

1999

10 4 2

DUPIC

가

2

2000

5 10

OR4 2

2 DUPIC

2.

1998

RIG

DUPIC

가

Rig

3

Rig guide element assembly,

top guide

rig

mini-element 가

가

960 mm

rig

56 mm,

3 mm

aluminum tube

locking part

DUPIC rig

element assembly

3 mini-element

3

, mini-element

가

1999

8 2

1

1

non - active

DUPIC

mini - element

rig

2

DUPIC

1

Rig

[2-3].

2.1

rig

1 mini - element 1 rig set -  
 screw 가 1 rig top guide  
 upper endplate  
 clamping nut grapple head  
 set -screw

2.2 Element assembly

3 mini - element 2 element  
 assembly  
 mini - element

2.3 Rig

3 rig rig  
 RIG rig  
 30 °

3. DUPIC

가 DUPIC  
 1 1986 10 24  
 3.21%, 35502 MWD/MTU  
 25cm  
 37  
 15  
 U-235

5.91mg/g, Pu-239/241      4.77/0.668mg/g      U-235      Pu-239/241  
 1.358%  
 10.09g/cm<sup>3</sup>,      10.58mmn,      9.88mm,  
 1.20 μ m

**4. mini-element**

1      mni - element      STS - 316L  
 Zircaloy-4      3  
 200 mm,      12.12 mm      zircaloy - 4      0.66 mm  
 Zrcaloy - 4  
 mini - element      4  
 가      1      TIG  
 TIG      가  
 5      500W      Nd:YAG  
 mini - element  
 6      가      3  
 space block, 5      , space block      (Al<sub>2</sub>O<sub>3</sub>)  
 , He leak test  
 [5].  
 가      7  
 280%      TIG  
 0.1      0.2mm      가  
 He      2.5x10<sup>-7</sup>cc/sec      He  
 He      He      95%  
 mini -  
 element

**5. DUPIC rig**

3      mini-element

5.1 Element assembly

8 element assembly 3 mini-element 가  
 lower housing housing supporting cooling  
 block , mini-element handle  
 Element assembly housing nut 10kgf.cm

5.2 DUPIC Rig

assembly rig M1 cell element  
 10, 11 DUPIC rig  
 nut set screw , clamping  
 12

5.3 DUPIC rig

DUPIC Rig cask  
 Pool

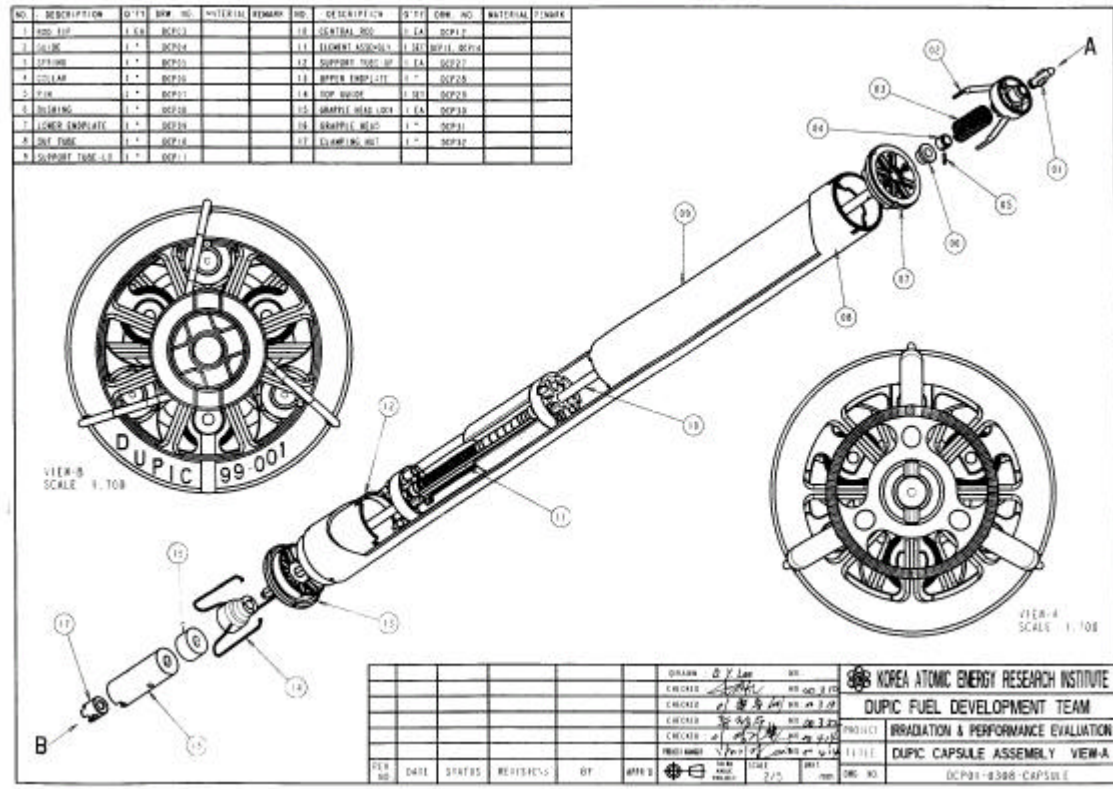
6.

OR4 DUPIC 가  
 22MW , 600mm MCNP code  
 43.66/50.09( / ) KW/m , 2000 MWD/THM  
 , , 가가  
 [3]. 가 OR4  
 13 DUPIC rig OR4  
 2000 5 10 2000 7 10 2  
 , , fission gas , , , NDA  
 [4].

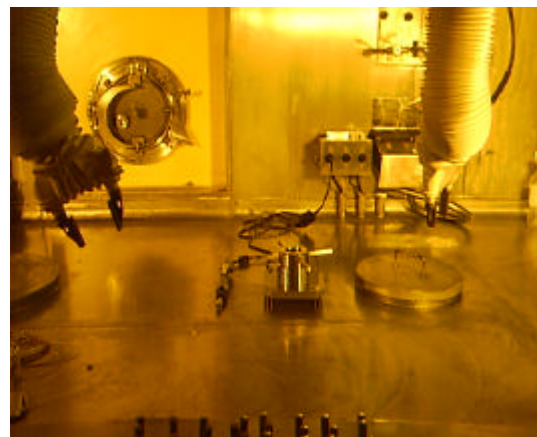
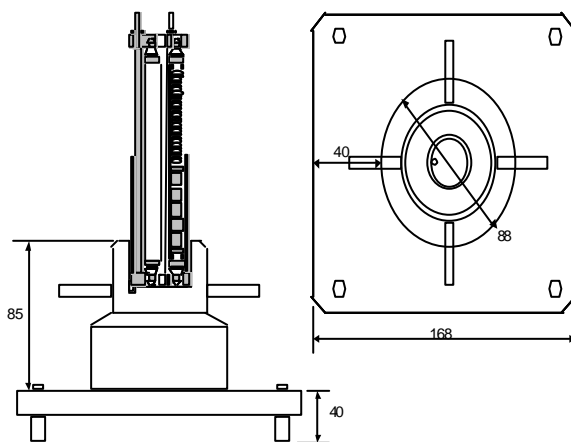
7.

DUPIC 가 , DUPIC  
 OR4 . 1999 8 1  
 DUPIC , 2  
 . 1 DUPIC  
 Rig 1  
 . DUPIC rig  
 가 .  
 2 3  
 rig .

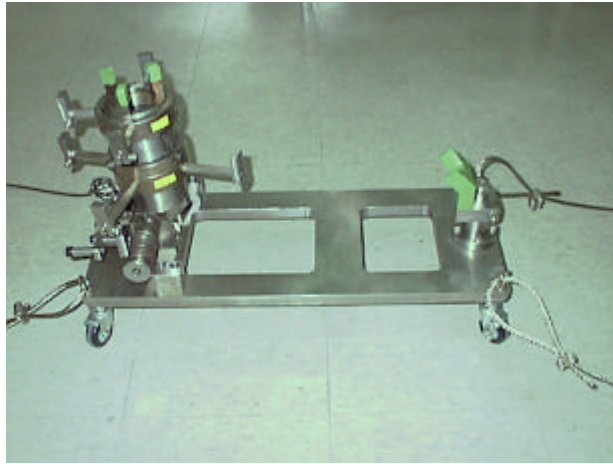
1. , , KAERI/RR-1760/96, ,  
 , 1997.
2. , DUPIC , ,  
 , 2000.  
 , 1999.
3. , DUPIC , KAERI/ TR-  
 1157/98, , 1998.
4. , . , KAERI/RR-2033/2000,  
 , , 2000.
5. ., Zircaloy-4 Nd:YAG LBW  
 , , 15 6 , pp 85-95, 1997.



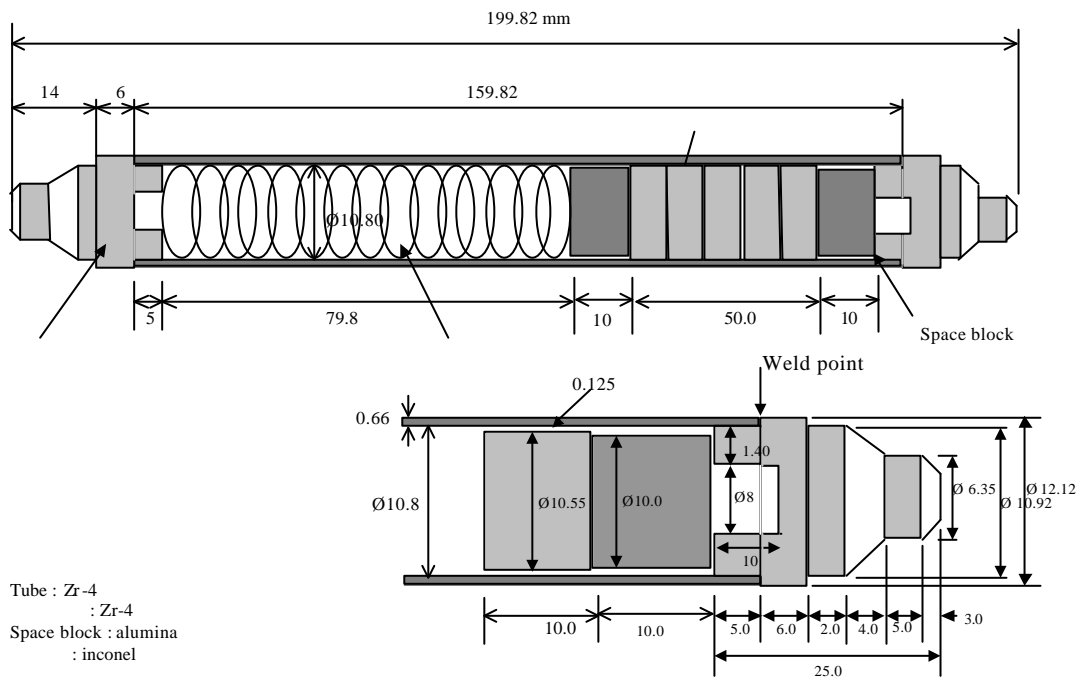
1. rig



2. Element assembly

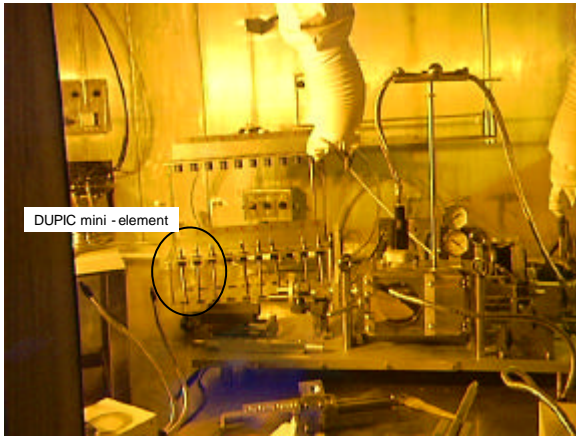


3. Rig



Mini-element(0.66mm tube)

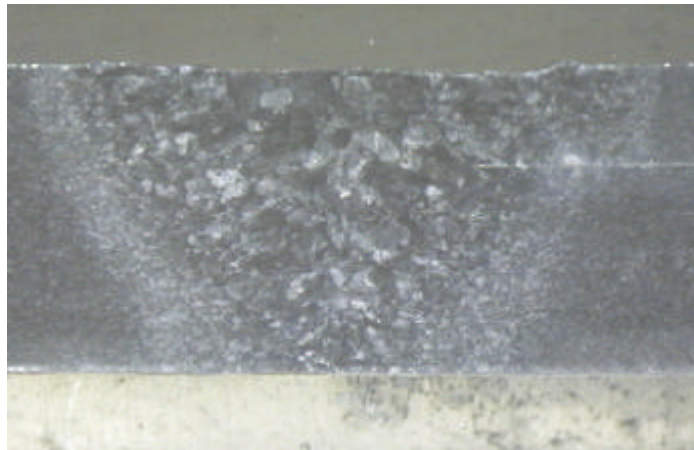




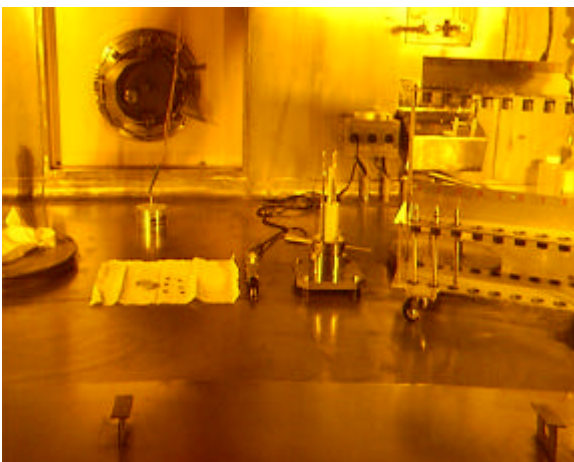
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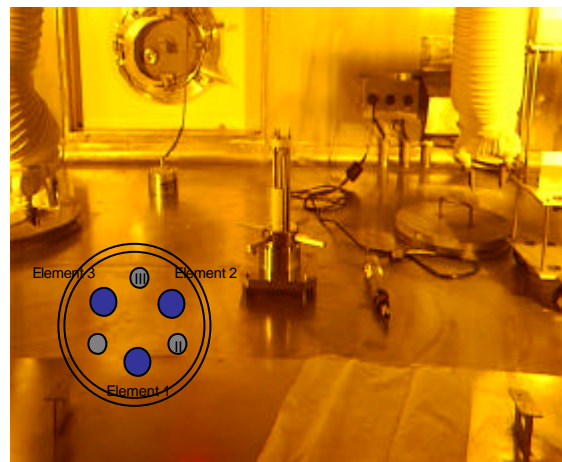
6. mini-element



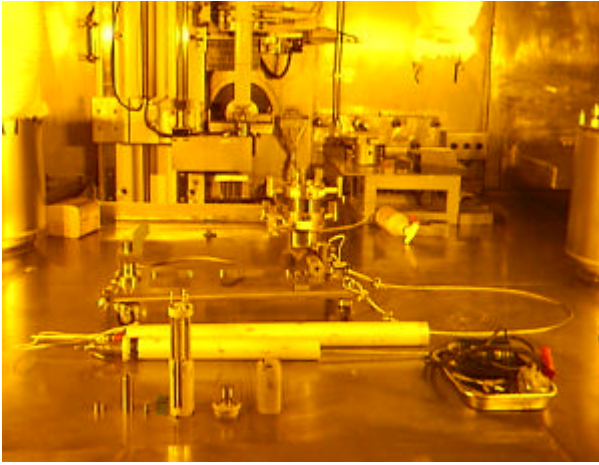
7.



8. Element assembly



9. Element assembly



10. DUPIC rig



11. DUPIC rig



12.



13. DUPIC rig