

가

## A study on the evaluation parameters of wear resistance through the wear tests of advanced Zr fuel claddings

150

가

Zircaloy-4, A B

가

( $D_e$ )

( $D_p$ )

가

가

### Abstract

Sliding wear tests have been performed in room temperature air and water in order to evaluate the wear resistance of advanced Zr fuel claddings. These results were compared with those of commercial alloys such as Zircaloy-4, A and B alloys. As a result, the advanced Zr fuel claddings have a similar wear resistance compared with the commercial alloys. The dominant factor governing the wear resistance is the protruded volume of wear debris that are performed on the worn area in air condition, but the accommodation of plastic deformation on the contact area in water. In addition, the worn area size was greatly affected by tested cladding materials. With worn area data, it can be suggested that the ratio of wear volume or protruded volume to worn area ( $D_e$  or  $D_p$ ) are used as the evaluation parameters of wear resistance.

1.

가

가

Zircaloy -4

가

Zircaloy-4, A B

가

가

가

가

( , )

가

5가

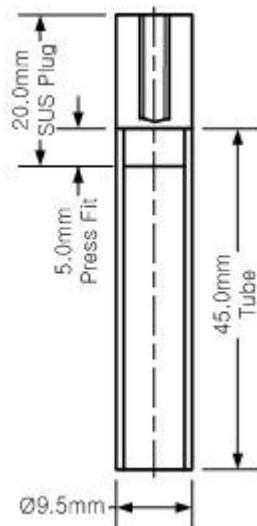
Zircaloy-4, A B

가

1.

		$\sigma_y$ (MPa)	
C1	Zr-0.2Nb-1.1Sn-T.E	595	226
C2	Zr-1.5Nb-0.4Sn-T.E	588	212
C3	Zr-1.5Nb-0.4Sn-T.E	591	220
C4	Zr-0.4Nb-0.8Sn-T.E	554	215
C5	Zr-1.2Nb-T.E	504	182

\* T.E: Transition element



1.

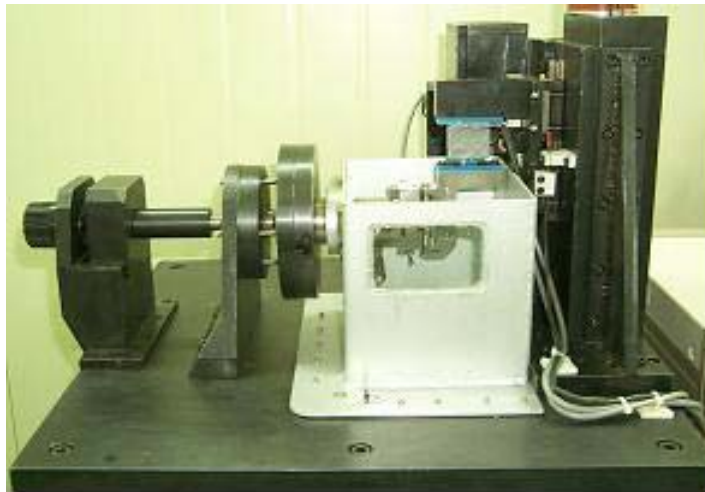


2. KAFD

2.

(1)

5가  
1 C1~C5  
1 45 mm  
(PLUS-7) KAFD  
2  
Zircaloy-4, A B Z4, A B



3.

(2)

10 N , 80  $\mu$ m , 30 Hz  
10  
3 ( )  
3  
가

(3)

3

[1, 2].

3.

(1)

2

가

C4

, 가

C5 A

C3

C2

C3

C1~C5

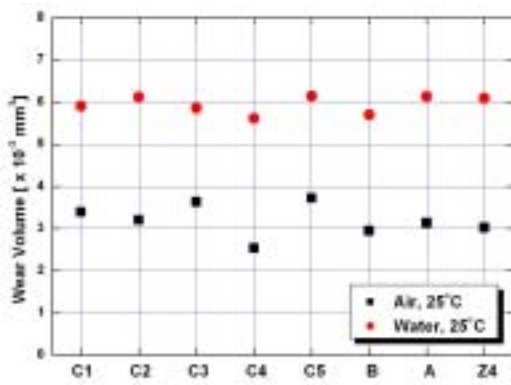
A, B Z4

가

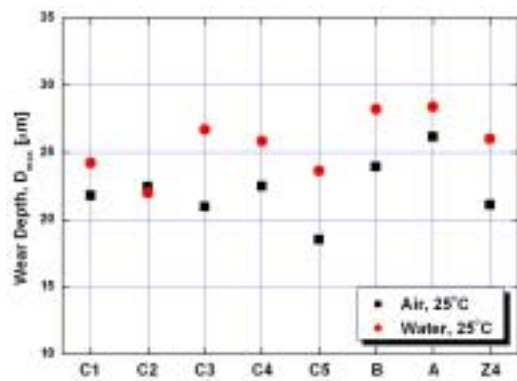
C4 B

, C2, C5 A

3



4.



5.

(2)

가

가

[3].

가

가

가

가

[4].

가

가

5

가

C5

C2

가

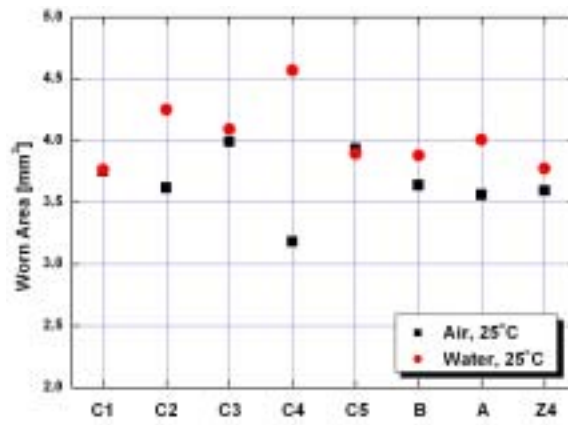
C4

가

가

가

가



6.

(3)

가

6

가

가 C4 가 가 C5 ( ) C2  
 가 가 C5 ( )

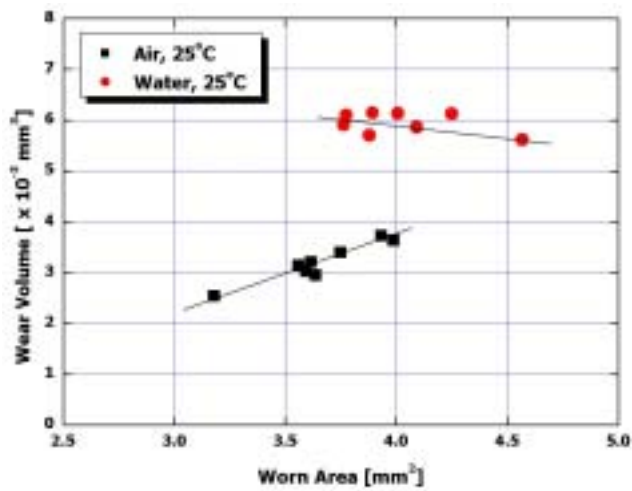
4.

(1) (D<sub>e</sub>)

가 7

가 가 가  
 가 가 가  
 가 (abnormal) 가  
 가 가

(D<sub>e</sub>) D<sub>e</sub>  
 가 가 D<sub>e</sub> 가



7.

(2)

[4].

가

가

가

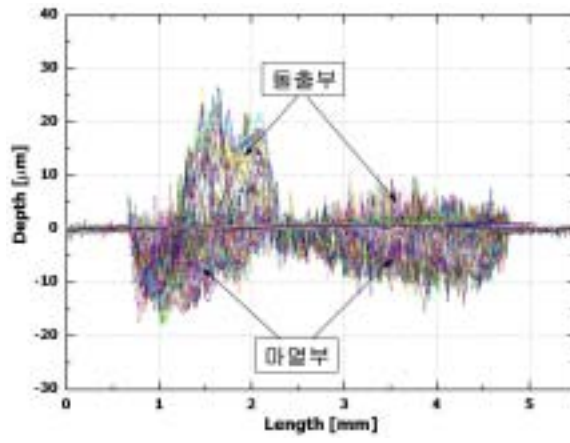
가

(protrusion)

8

가

가



8.

(C5 ).

9

가

가

가

가

가

가

(D<sub>p</sub>)

D<sub>e</sub>

가

10

C4

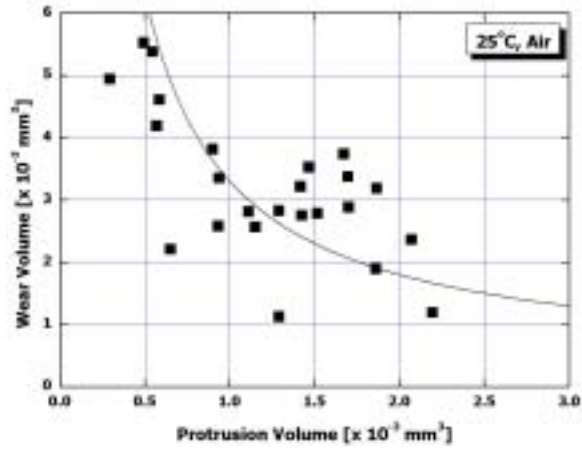
Z4

가

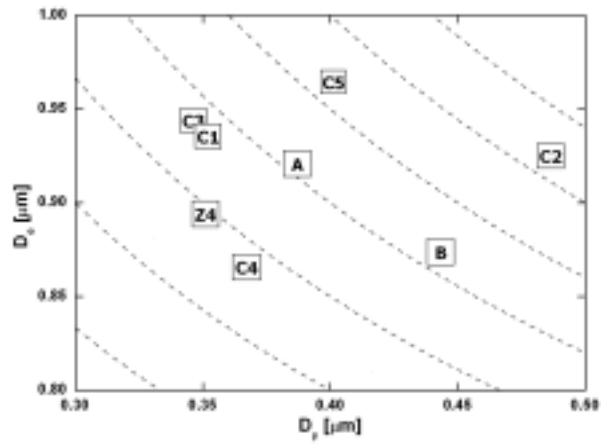
가

C2

가



9.



10.  $D_p$   $D_e$

(3)

11

가

[5].

(가

가

가

) 가

10 N

12

C4

가

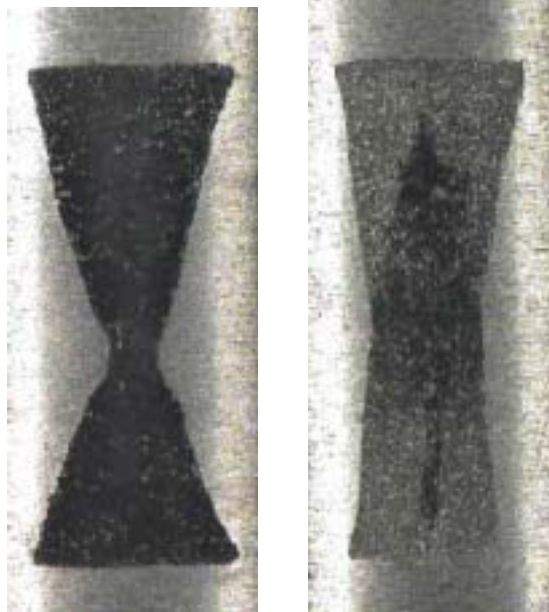
$D_e$

C1

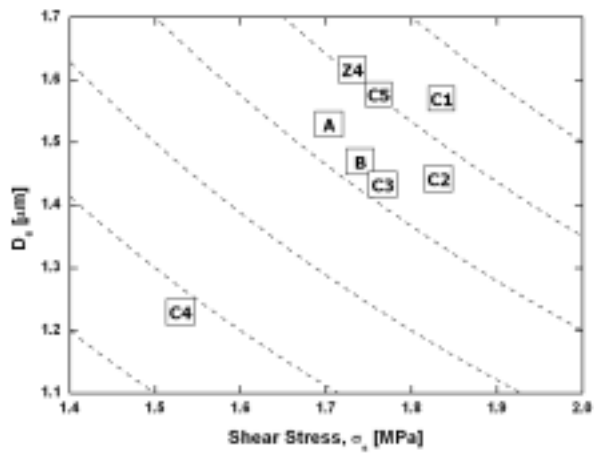
가



(D<sub>e</sub>) 가 가 가 D<sub>e</sub> 가



(a) (b)  
11. (C5 ) .



12. D<sub>e</sub>

5.

C4

A, B Z4

, , 가 가

가 가

가 , 가 가

가 , 가 가 가

가

[1] 1 , “ ”, , 17 1 (2001) 33-39.

[2] 1 , “ 가 ”, KAERI/TR-2479/2003.

[3] Y.H. Lee 4 , “A comparative study on the fretting wear of steam generator tubes in Korean power plants”, WEAR 255/7-12 (2003) 1198-1208.

[4] Y.H. Lee 3 , “A study on wear coefficients and mechanisms of steam generator tube materials”, Wear 250 (2001) 719-726.

[5] 4 , “ ”, 2002