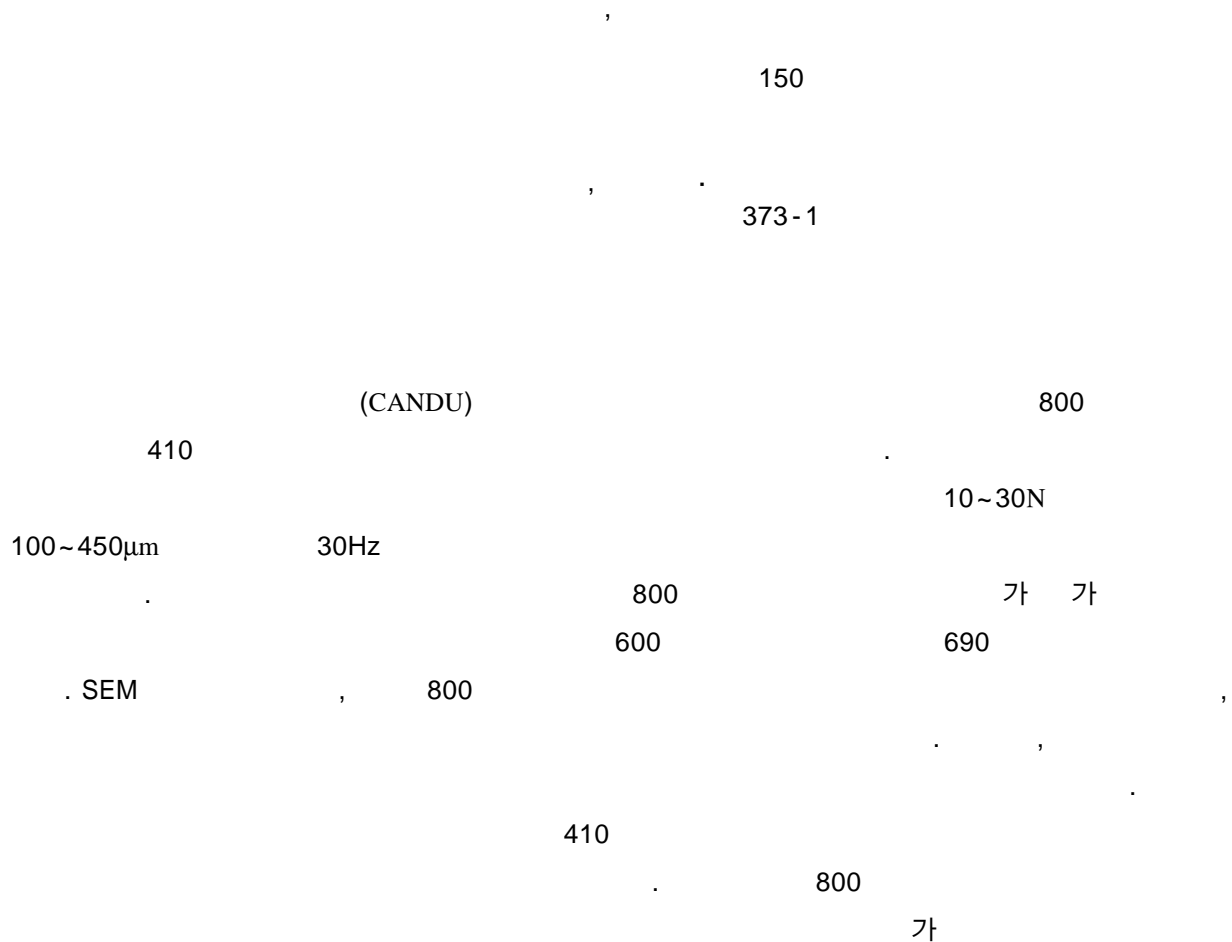


2002

800

Experimental Investigation on the Fretting Wear of Alloy 800 in Room Temperature Water



Abstract

Fretting wear test in room temperature water was performed to evaluate the wear coefficient of CANDU (CANadian Deuterium Uranium) steam generator (SG) tube material (Alloy 800) against 410 type martensitic stainless steels. The main focus is to compare the wear behaviors between Alloy 800 and Inconel 690. Test conditions are 10~30N of normal load, 200~450µm of sliding amplitude and 30Hz of frequency. The result indicated that the wear rate of Alloy 800 was higher than those of Inconel 690 at various test condition such as normal loads, sliding amplitudes etc. From the results of SEM observation, there was little evidence of plastic deformation layer that were dominantly formed on the worn surfaces of Inconel 690. Also, wear particles in

Alloy 800 were released from contacting asperities deformed by severe plastic flow during fretting wear. Main cause of wear rate between Alloy 800 and Inconel 690 may be due to the difference of hardness between martensitic and ferritic stainless steel. The wear rate and wear mechanism of two tubes in room temperature water are discussed.

1.

2
(Flow-
Induced Vibration, FIV) 가
가
가
Frick Work-rate
[1-3], 가
가 (600, 690
800)
800

2.

2.1

가 800
410
1 0.1mg 가
5

2.2

1

50~400 μ m 30Hz

10~30N,

2.3

(SEM)

3.

3.1

2

(, mg/m)

가

690 , 가 (690) 가 가 [4]. 가

3

800

690

800 ,

410

3.2

800

Work-rate

4

690

800

가

가

[3].

800 가
(Impact-fretting wear)
(Reciprocating sliding wear)
(Partial slip) (Gross slip)

가
690

3.3

5 (Scanning Electron
Microscopy, SEM)
가 800

690 가 410

410 800 가

가

가 690 800 , SEM 800

3.4

가 6 가

가 SEM

가 7

가 가

가

800

690

가 410

4.

800

410

(1)

800

690

(2)

690

$67 \times 10^{-15} \text{ Pa}^{-1}$

가

(Work-rate)

(3) SEM

690

(4)

410

800

410

21

[1] N. J. Fisher et al. "Experimental fretting-wear studies of steam generator materials", J. Pressure Vessel Technology, Vol. 117, p312-320, 1995

[2] F. M. Guerout et al, "Effect of temperature on steam generator fretting-wear", ASME Int' Conf, of PVP, Vol. 328, Flow-Induced Vibration, p233-246, 1996

[3] F. M. Guerout and N. J. Fisher, "Steam generator fretting wear damage: A summary of recent findings", J. Pressure Vessel Technology, Vol. 121, p304-310, 1999

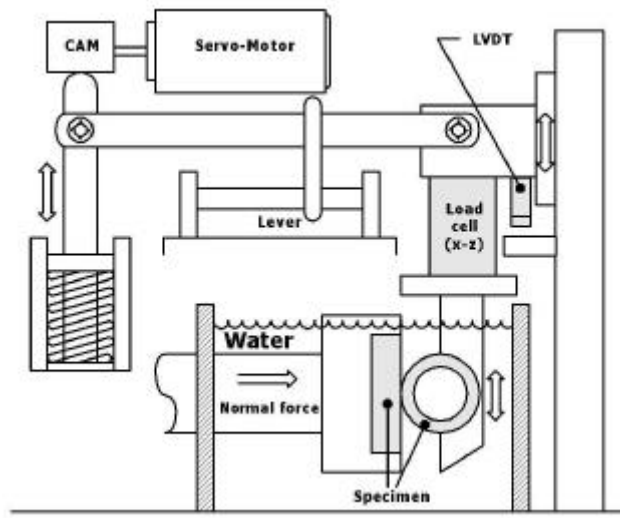
[4] Y. H. Lee, Ph.D thesis, Dept. of Nuclear Eng. KAIST, 2002

1.

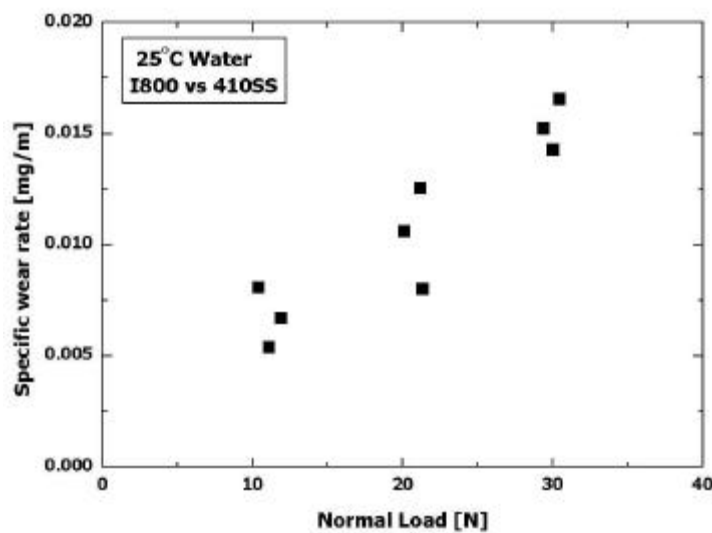
800 410

(w/o)

Specimen	Cr	Fe	C	Si	Mn	Ti	P	S	Co	Ni
Alloy 800	21.54	Bal.	0.02	0.43	0.73	0.54	0.01	0.001	0.015	32.73
410SS	11.5 ~13.5	Bal.	0.15	0.75max	1.00	0.15	0.04	0.03	-	0.5max

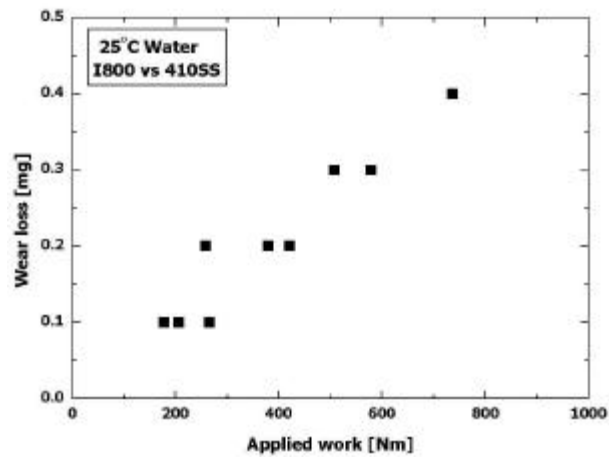
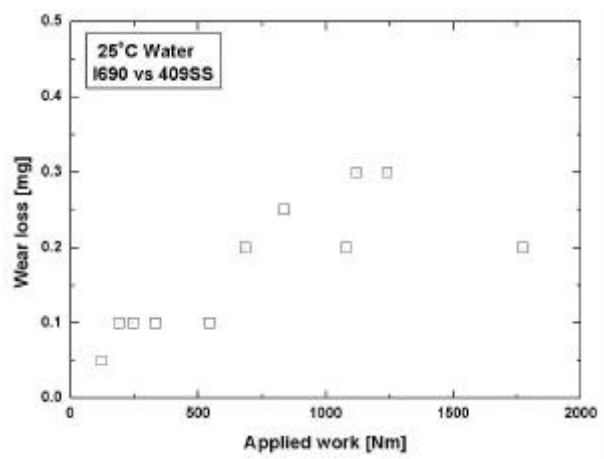


1.

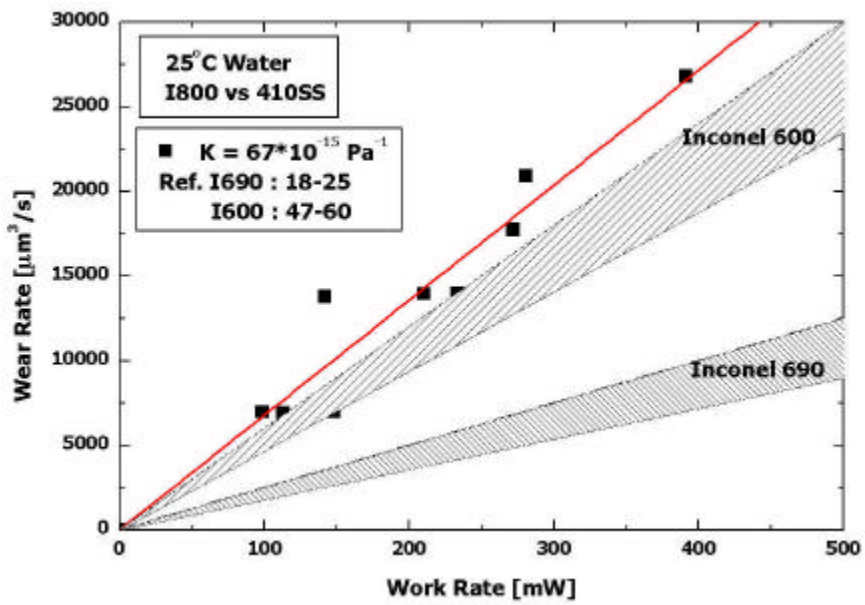


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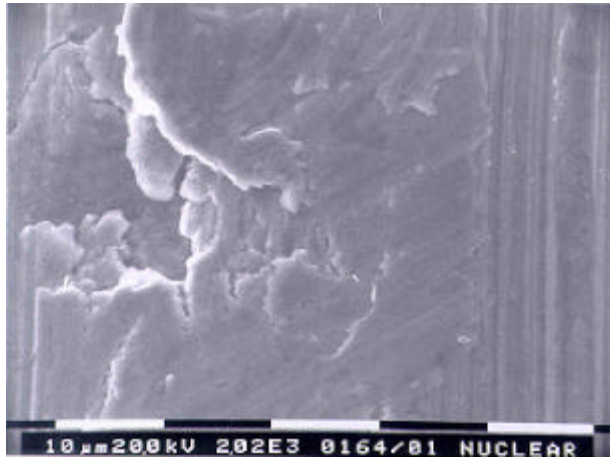
(/)



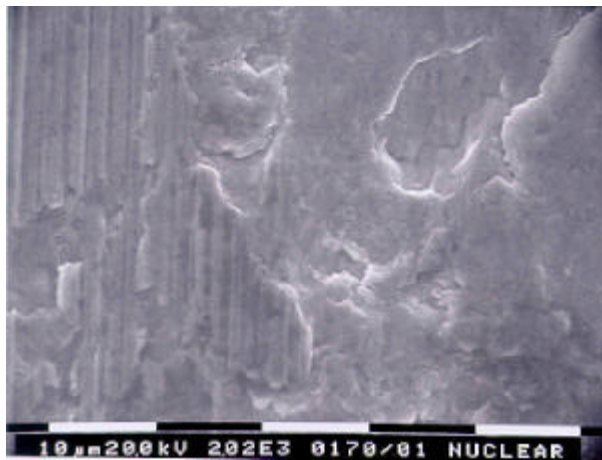
3. (*)
(690, 800)



4. 800



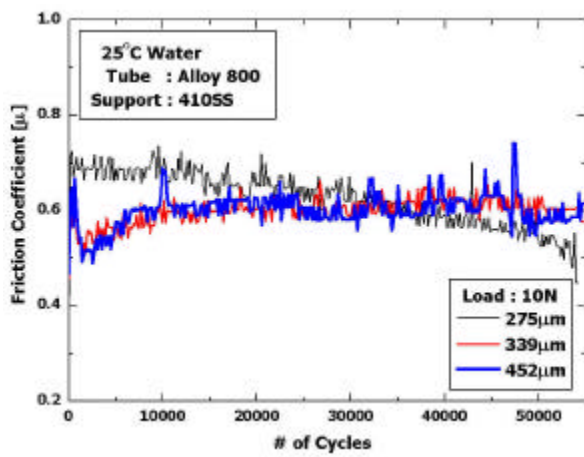
(a) 800



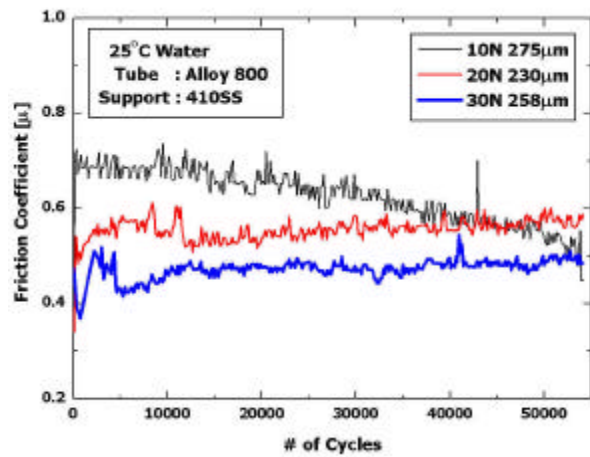
(b) 410

5.

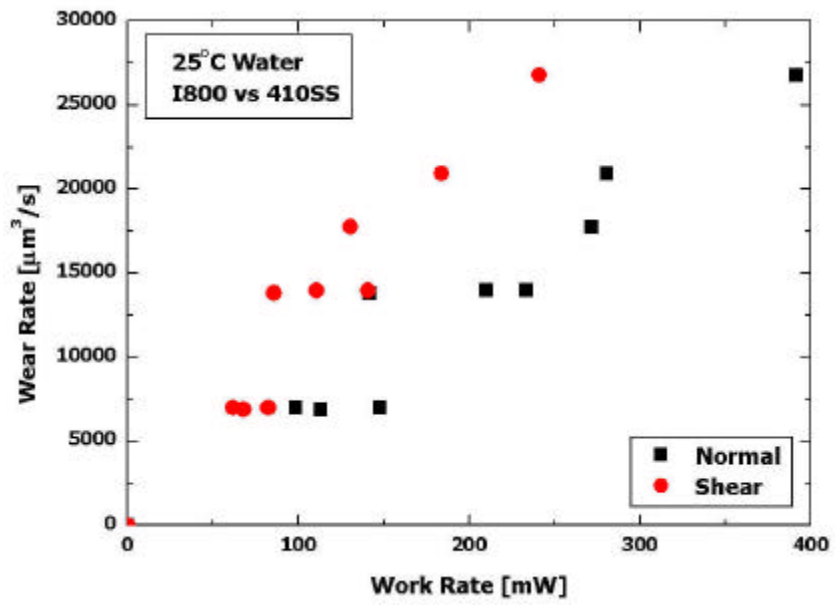
SEM



6. 410



800



7. work-rate
가