

Safe Hydridding of Hydrogen Isotopes

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150

Abstract

The use of hydrogen isotopes in a PHWR raises particular safety issues due to the combined effects of their physico-chemical properties and radioactive nature. Even if the safe handling of hydrogen isotopes has already been demonstrated, it is unanimously recognized that further efforts are still to be concentrated on the improvement of current concepts. The aim of this article is to verify the most prominent safety related aspects associated with the design and operation of hydrogen isotope storage vessels.

1.

가 가 가

가 .

가

가 ,

가 가 1/10,000

가

[1-4].

2.

2-1.

Ti sponge

가

Ti sponge 가

2

valve filter

valve

가

Ti sponge

50

-3

KEPIC QAP 18

2-2.

[ASME SEC. Div.1]

가

가

rounding

Rounding

3.

3-1.

가

25

10^{-15} Pa

500

5 kPa

, 1000

가

pump TMP(turbo molecular pump) , 1×10^{-6} torr , rotary
 welded bellows-sealed , Baratron gauges
 (0-2,0-1000 torr) . 510cc ,
 가 10liter . 가
 manifold 267cc .

3-2.

SUS 316
 2.1cm, 20cm . copper gasket
 가 1/4inch ,
 2 μ m SUS .
 , VCR male nut .
 99.5% ,
 2-12mm .

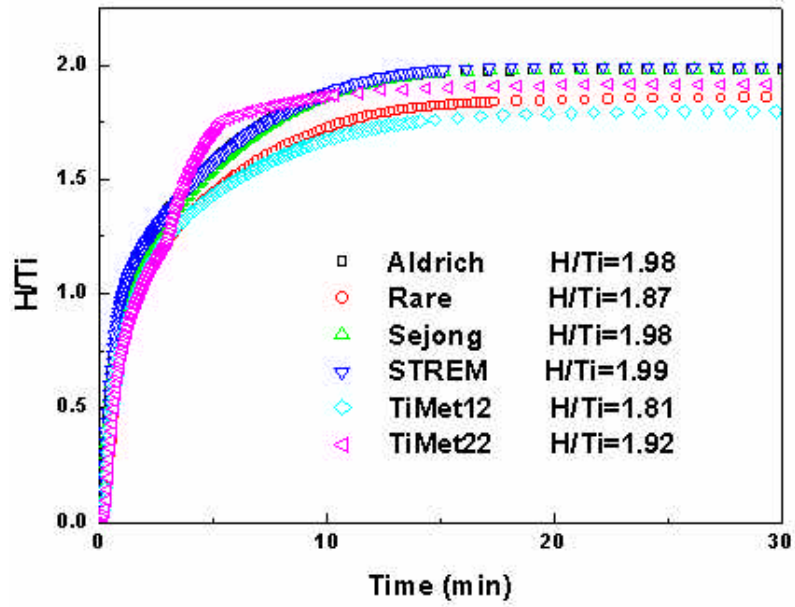
(vacuum annealing)

500 2 , 가
 (H/U) 1.95 .

3-3.

가 가 가
 가 Aldrich , STREM , Rare earth
 Titanium Metal 2 가
 5-20mm , 99.7% Ti STREM
 99.5% . 500 , 2
 H/Ti=2.0 (450torr
) . 1

Aldrich STREM Sejong



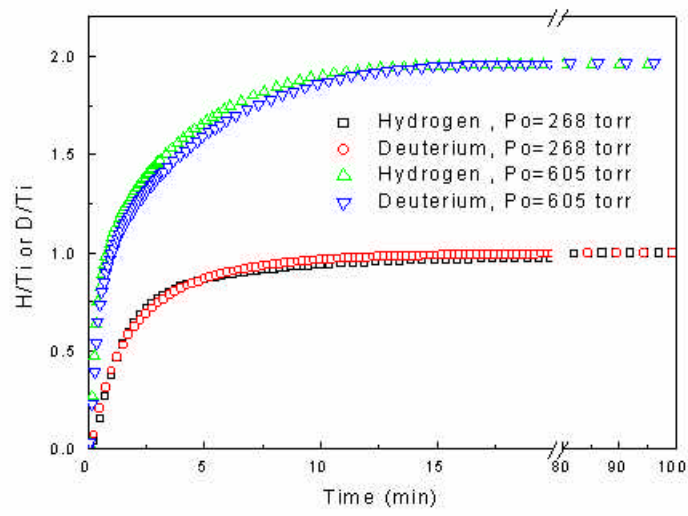
1.

3-4.

605torr H/Ti D/Ti 1.0 2.0 가 268torr

10

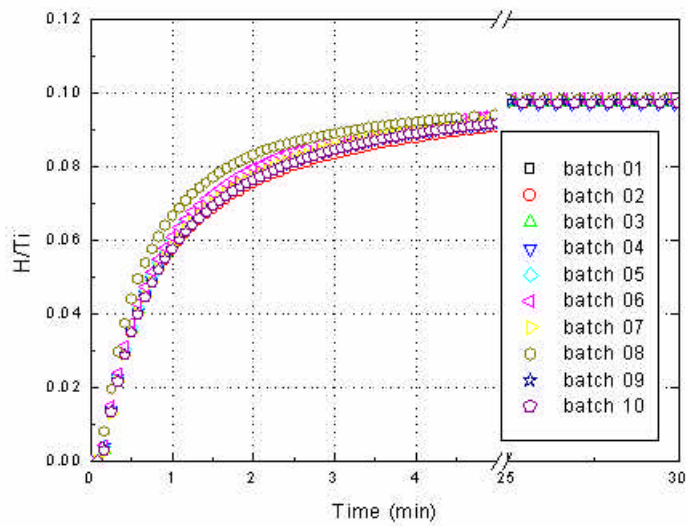
가



2.

3-5.

가 H/Ti 0.1 가 (H/Ti) 3 가 1.0 (zero)

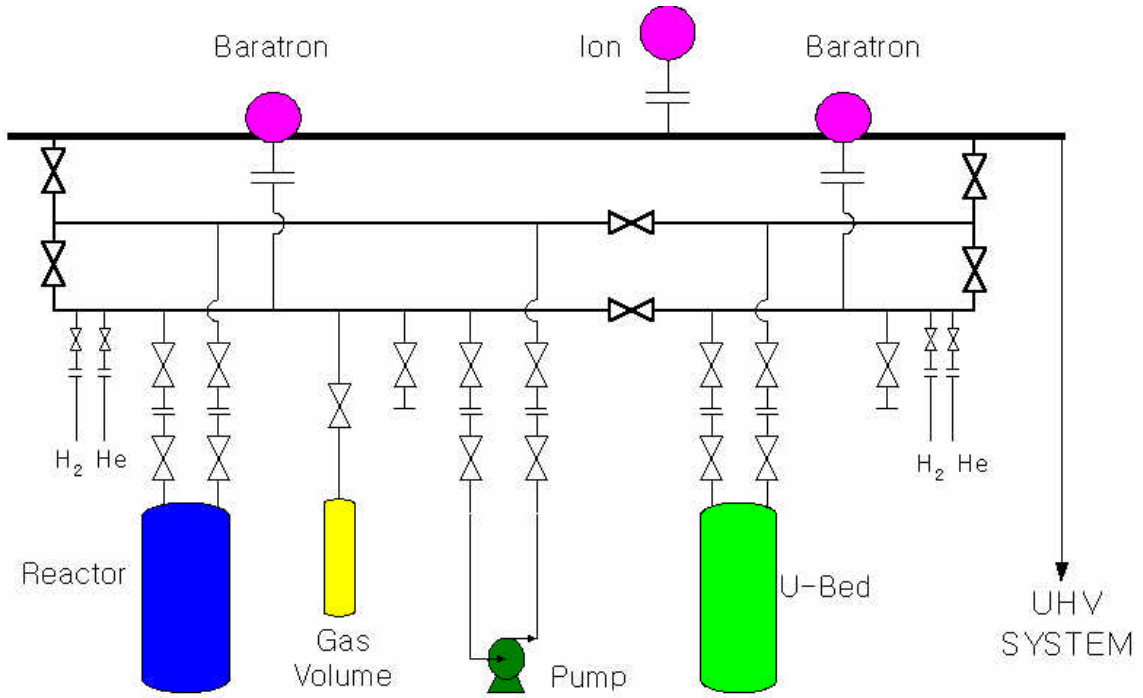


3.

4.

4-1.

4 rig
 glove box rig 가 UHV , gas
 Ar glove box , Ar ,
 가



4. rig

4-2.

Rig

U가

5

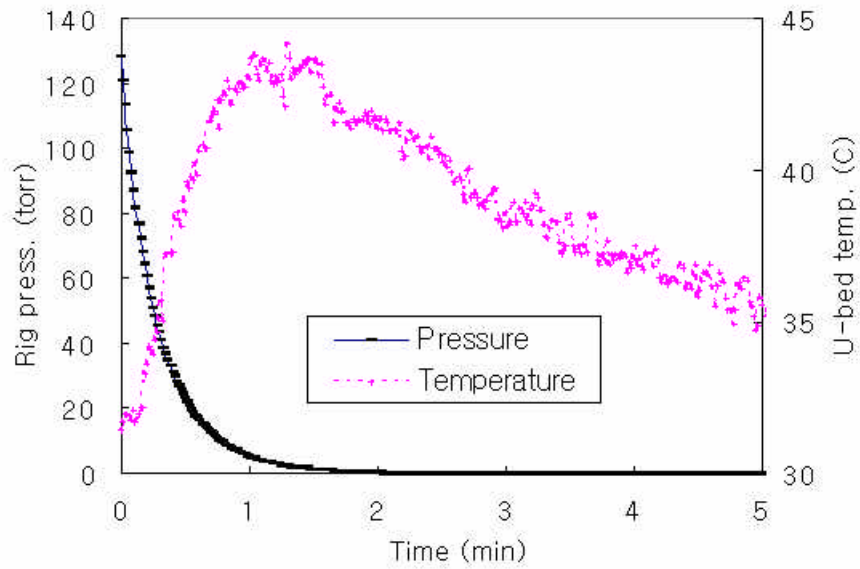
가 128 torr, 238 cc

U가 1g

rig

U-bed

.



5.

4-3. Ar

glove box , ,
glove box Ar / , ,
. glove box Ar glove
box 가 가 가 . /
wjs , ,
500 가 heater 가 .
/ molecular sieve,
가 가 .
. 6000 가 .
g 2.3cc , 가 가 가
Cu2O CuO . 150 300
vol.%) (5
. Molecular sieve 27
1g 0.031g 가 가 가 . 205 593

St 707 , St 707
 (70%), (24.6%) (5.4%)
 400 500 (10-3 Torr) 10
 가 가 가 , 350
 3 100% . St 707
 , , Ar
 glove box Ar ,
 25 350 , 가 가
 가 . g 100 Torr- , 20 Torr- 가
 가 PCT
 , 500 1 Torr- , 10-3
 Torr . 가 St 707 500 10-3 Torr
 1 Torr- .

5.

Ti sponge 50
 -3
 KEPIC QAP 18
 Ti sponge He-3 가
 가 가
 가
 Aldrich STREM

가

6.

1. , “ ”, , 15 2 , pp.43-48 (2000)
2. Holtlander, W. J., Drolet, T. S., and Osborane, R. V., *"Recovery of Tritium from CANDU Reactors, Its Storages and Monitoring of its Migration in the Environment"*, AECL-6544 (1979)
3. Holtlander, W. J., and Yaraskavitch, J. M., *"Tritium Immobilization and Packaging using Metal Hydrides"*, AECL-7151 (1981)
4. Perevezentsev, A. N., et. al., *"Safety Aspects of Tritium Storage in Metal Hydride Form"*, Fusion Technology vol. 28, No. 3, Pt. 2, pp.1404-1409 (1995)

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