

가

(lattice diffusion coefficient)

(UO₂) 1960 [1,2,3,4,5,6].

UO₂ 가

가

Olander[7] Uffelen[8]

(UO₂)

가

가

(post irradiation annealing test)

2.

2.1

(Simfuel) 27,300 MWd/t-U

ORIGEN-2

.(-1)

-1

-2

(Equivalent sphere)

(a)

1mm

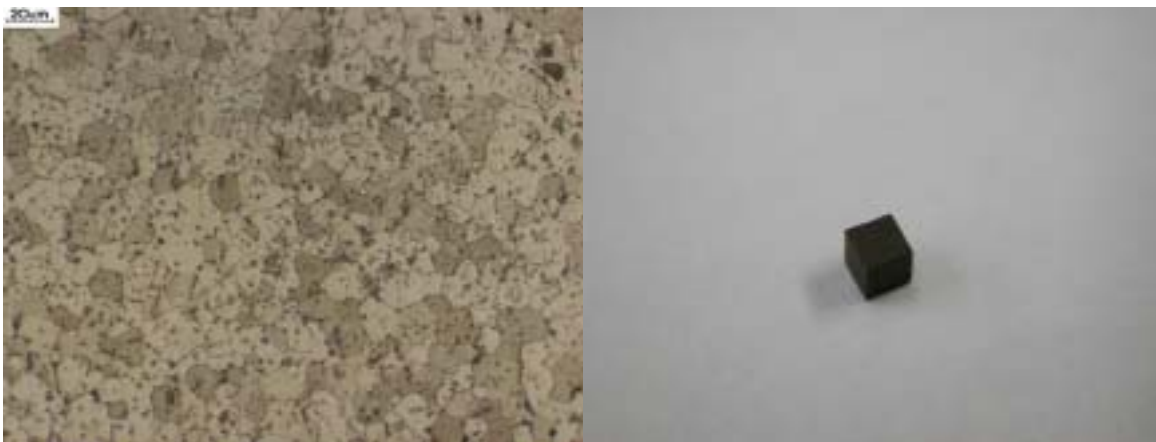
- 1

(27,300 MWd/t-U, 300mg)

	(mg)		(mg)
Rb	0.072321	Te	0.098539
Sr	0.140618	Ba	0.387635
Y	0.092153	La	0.355454
Zr	0.749788	Ce	1.673200
Mo	0.684450	Nd	1.225331
Ru	0.609844	U-235	1.826756
Rh	0.085663	U-238	255.462849
Pd	0.287959	O	36.247441

- 2

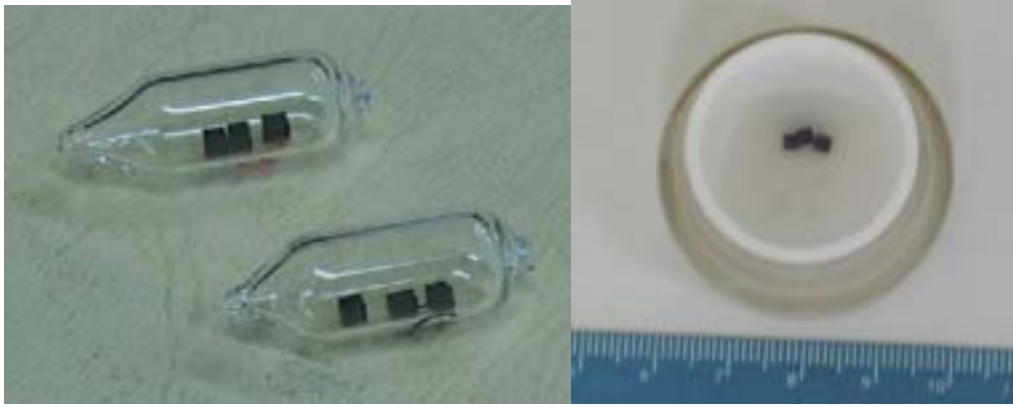
			(μm)	(mg)	(MWd)
P-Sim-1		97.5% (10.52 g/cm ³)	10 \pm 2	262.6	2.3X10 ⁻⁸
P-Sim-2				293	



- 1

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- 2 () 가 가 ()

-2 가 가

1

20

0.1 MWd/t-U

HTS

가

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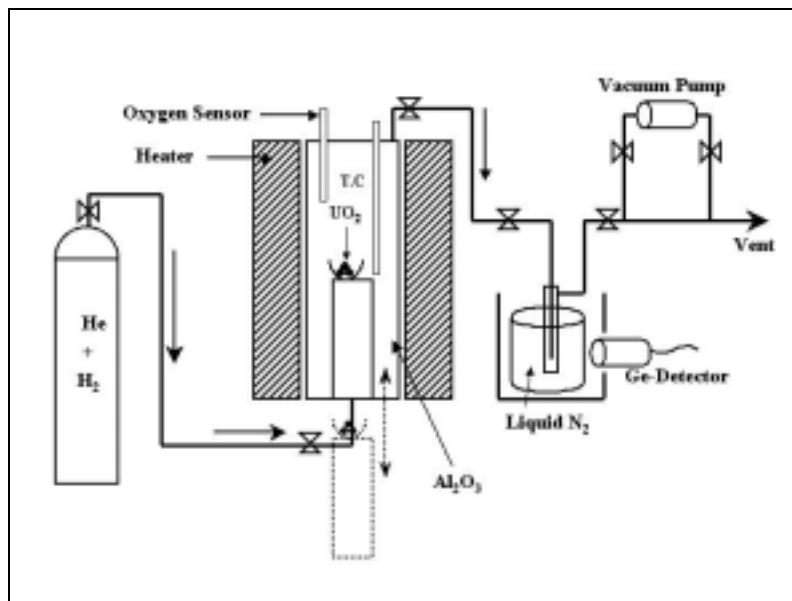
가

가

2.2

가

가



가 가 .
 가 -3
 [9].

2.3

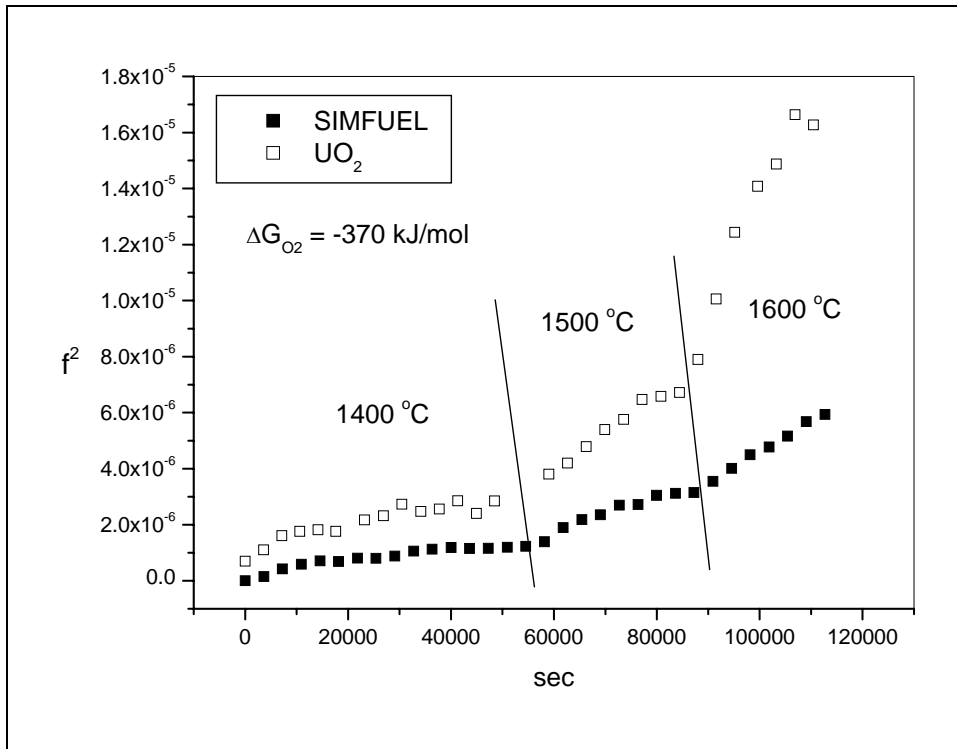
가 30 . 가 Xe-133 3600
 가 ,
 (1) Booth [10].
 가 (1) f t^{1/2}
 f² t 가
 .[11,12]

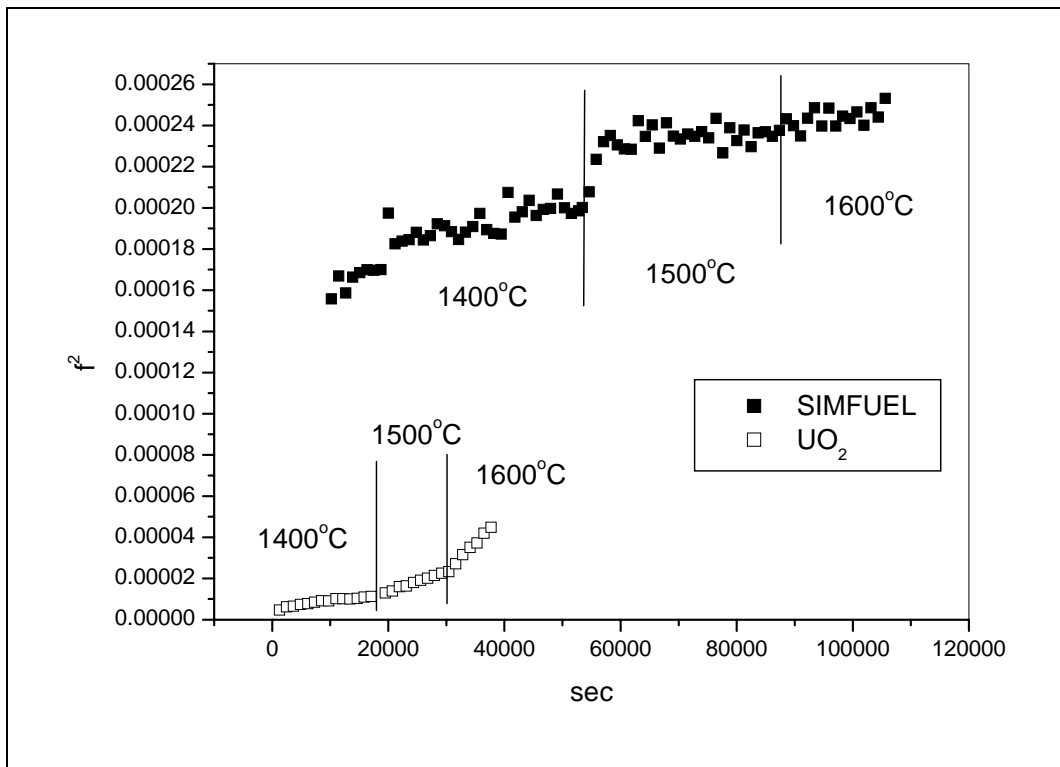
$$f^2 = \frac{36D}{a^2 \pi} t \quad (1)$$

(1)
 ORIGEN-2
 Xe-133 가 .
 가 Xe-133 가 .
 가 가 가
 I-132(668keV,772keV) La-140(815keV) 3
 Cs-137(662keV) ORIGEN-2
 Xe-133 . 가
 Ba-133(81keV-33%) . Ba-133
 Xe-133 가 .
 (1)
 가
 10%, 0.1%
 3가

3.

O/M , 20 kJ/mol
 가 -370kJ/mol
 (+ -10%), -250kJ/mol(+ -0.1%) -110 kJ/mol(+)
 Lindemer[13] 가 , x 0.0005, 0.01 0.16 .





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(P-Sim-2, $\Delta G_{O_2} = -250\text{kJ/mol}$)

-4

-5 ORIGEN-2

가

가

(1)

-3

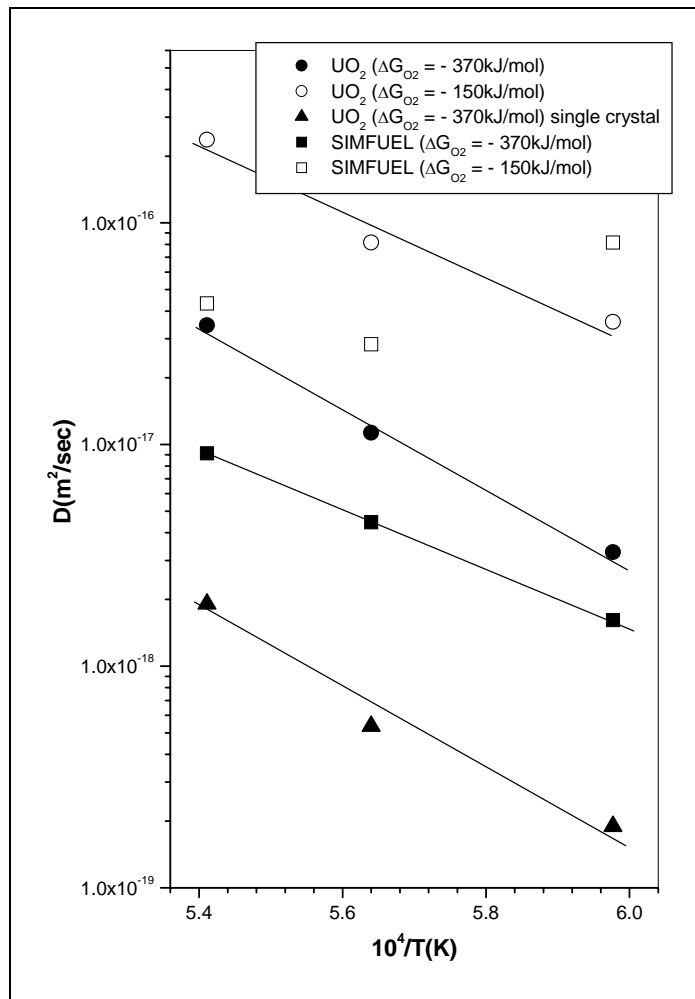
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- 3

		$(\text{m}^2/\text{s})^*$			(kJ/mol)
		1400 °C	1500 °C	1600 °C	
P-Sim-1	-370kJ/mol	1.6×10^{-18}	4.5×10^{-18}	9.1×10^{-18}	227
P-Sim-2	-250kJ/mol	8.1×10^{-17}	2.8×10^{-17}	4.3×10^{-17}	-

* measured diffusion coefficient contains less than 20% error.



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5.

가

. Xe-133

Booth

. 가 (equivalent sphere)

(a)

($D' = D/a^2$)

$$D'_{app} (s^{-1}) = 4.4 \times 10^{-4} \exp\left(\frac{227(kJ/mol)}{RT}\right) \quad (\Delta G_{O_2} = -370 kJ/mol) \quad (2)$$

3가

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