

가 가

### Manufacture and Performance Test of Microwave Oven for Uranium Oxide Sintering

, , , ,

150

가

. 가 2.45GHz 10kW 가 applicator .

가

UO<sub>2</sub>

가

UO<sub>2</sub>  
95%TD

가 UO<sub>2</sub>

#### Abstract

Microwave oven for sintering oxide nuclear fuel pellets was manufactured and its performance test was conducted. A multi-mode type cubic applicator was used, and a magnetron which generates maximum output of 10kW and operates at a frequency of 2.45GHz was equipped in this microwave oven. Housing box to prevent thermal losses and preheat specimens was also designed and mounted in the applicator. By using the manufactured microwave oven, UO<sub>2</sub> pellets which have a density over 95%TD were successfully sintered.

1.

. UO<sub>2</sub>

1700



가 .

wave guide

가 cavity

가 .[3]

가 . 가

$$P = 2pf_e e_r \tan \delta |E|^2$$

tan

가 .[4]

가 1940 Hippel[5]  
Al<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub>, BaTiO<sub>3</sub>

가 가

가

Thornton[6] UO<sub>2</sub> 1983  
1.6kW 가

가 가 1650  
가 95% UO<sub>2</sub>

가 housing 가 [7]. 가

housing . 가

가 가

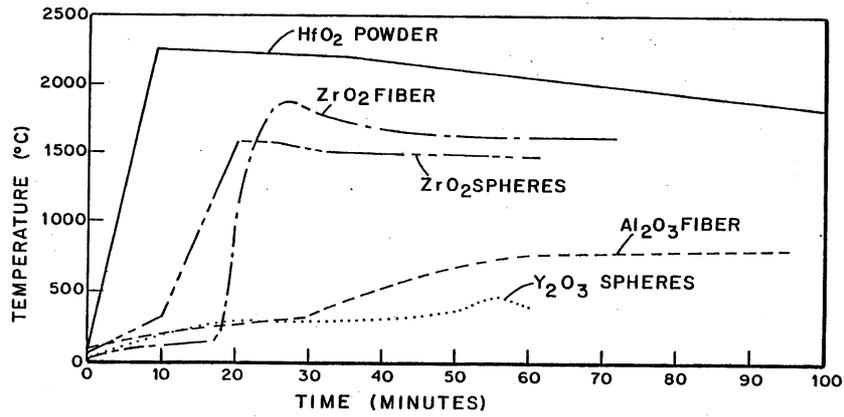
insulation box 가

1

mulite board

가

ZrO<sub>2</sub> SiC



1. 2.45GHz

1.6kW

가

[8].

3.

가

가

가

가

가

hot zone

가

가

가

가

가

thermocouple

가

가

thermocouple

thermocouple

shielding

가

가

가

가 가

cavity

가

가

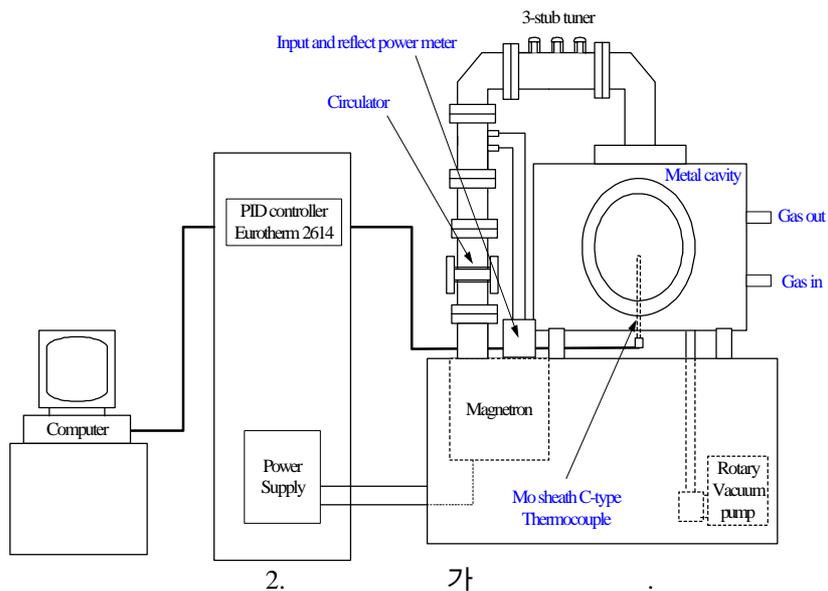
1

2 3

가

1. 가

	<ul style="list-style-type: none"> <li>1) FREQUENCY : 2450MHz ± 50MHz</li> <li>2) OUTPUT POWER : 0 ~ 10KW</li> <li>3) POWER SUPPLY INPUT : 220Vac ± 10%, 60HZ, 3</li> </ul>
	<ul style="list-style-type: none"> <li>1) Microprocessor operated PID controller</li> <li>2) Mo sheath C-type thermocouple</li> <li>3) Temperature control software</li> <li>4) computer</li> </ul>
	<ul style="list-style-type: none"> <li>1) RF-COUPLER : ARC SENSOR</li> <li>2) ISOLATOR : WAVE GUIDE</li> <li>3) 3-STUB TUNER :</li> <li>4) DIRECTIONAL COUPLER</li> <li>5) E-BEND CORNER : WAVE GUIDE</li> </ul>
Cavity	<ul style="list-style-type: none"> <li>1) : stainless steel</li> <li>2) Stirrer :</li> <li>3) Visible port : Shield Screen</li> <li>4) Inlet hole : : 2 hole</li> <li style="padding-left: 20px;">Gas : 1 hole</li> <li style="padding-left: 20px;">: 1 hole</li> <li>5) Outlet hole : Gas : 1 hole</li> <li style="padding-left: 20px;">: 1 hole</li> <li>6) : W450xD400xH450 (mm)</li> <li>7) Waveguide cavity 가</li> <li style="padding-left: 20px;">Quartz plate</li> <li>8) 가</li> </ul>
가	<ul style="list-style-type: none"> <li>1) :</li> <li>2) :</li> <li>3) 4 channel MFC</li> </ul>





3. 가 .

4.

가

1700

가 insulation box

ZrO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, SiC, Mulite 4

가 가 insulation box . ZrO<sub>2</sub> SiC

Al<sub>2</sub>O<sub>3</sub> Mulite

. Insulation

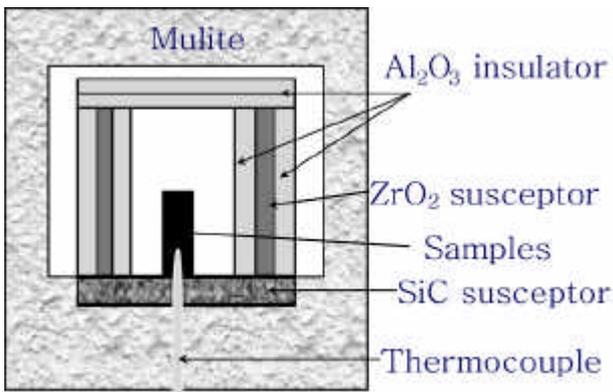
UO<sub>2</sub>

thermocouple

thermocouple

housing

4



4. housing box

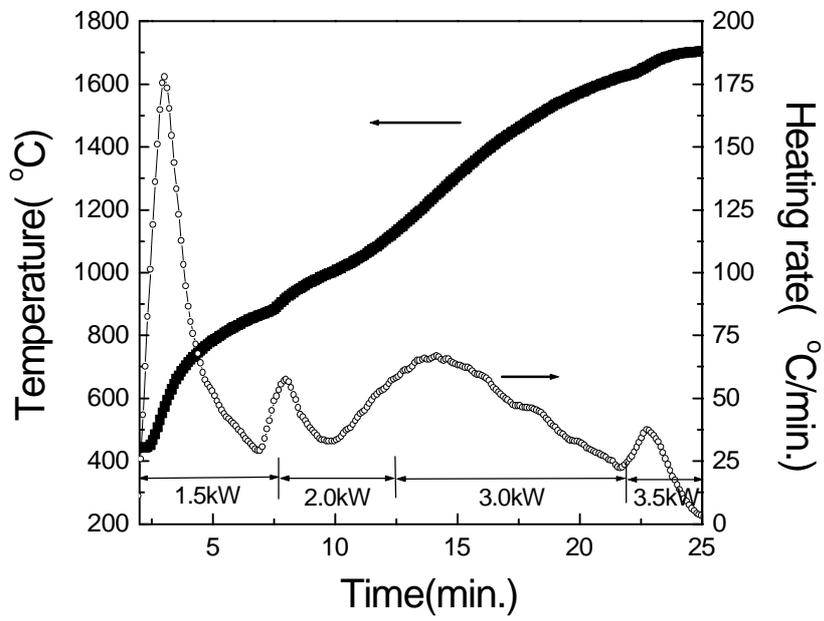
4

Mulite

, ZrO<sub>2</sub>

Al<sub>2</sub>O<sub>3</sub> tube  
SiC Board

5 가 4  
6 UO<sub>2</sub> 가 2kW 1  
95.1%TD 95.4%TD 가



5. UO<sub>2</sub>



6.

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