

가 UO₂

Properties Changes of UO₂ pellet adding Oxidized Powder Produced at Different Temperatures

150

150~350°C

가가 UO₂

. 150°C

250°C

가

가

350°C

가

U₃O₈

가

가

. 350°C

가

UO₂

. 150°C

가

가

가

Abstract

Properties of UO₂ pellet in which oxidized powders produced at the temperatures range of 150 to 350 °C were added have been investigated. Properties of the oxidized powder added pellets were not much different from those of pellet scrap added pellet except the pellets where powders oxidized at 150°C and 250°C were added. Their sintered densities were increased. A number of surface defects could be found in the pellet where powders oxidized at 350°C were added. These powders were so active that their sinterability was much faster than virgin UO₂ powder. It led to the gap between matrix and oxidized powder segregated area. The gap did not disappear until the end of sintering process and it became surface defect. Density increase due to the addition of 150°C oxidized powder did not change greatly with its amount.

1.

U_3O_8 가 U_3O_8 가 UO_2 가
 . 12 wt% U_3O_8 가
 wt% U_3O_8 . , 가 U_3O_8 8 ~ 10 wt% 2 ~ 4
 10 wt% 가 가
 U_3O_8 가 가 가
 . U_3O_8 가
 가 UO_2 가
 450°C 2 U_3O_8
 grind sludge 350°C
 UO_2
 UO_2
 . UO_2 [1]-[5]
 가
 UO_2 350°C U_3O_8 가
 150°C 가 UO_{2+x} U_4O_9
 250°C U_3O_7 U_3O_8
 . 가 가 가
 가

2.

1)

UO₂
Table 1 . 가
box
150, 250, 350°C 200g 4
, O/U . UO₂ U₃O₈ 8 wt% 가
4 wt% 가 turbular mixer 1
. 150°C 가
가 150°C 4, 8, 12 wt% 가
. 가 5.85±0.05 g/cm³ 가
. 1740°C-4
가 UO₂
1700°C 24 ,

2)

1250°C 1 30 CO₂ 가
linear intercept .

dilatometer

3.

1)

가

150, 250, 350°C

가

Fig.1

150°C

4% 가

가

가

. 250°C

가

U_3O_8

12 wt% 가

standard

가

X-

150°C

U_4O_9

가

UO_{2+x}

UO_2

5.4507A

가

가 UO_2

. 250°C

U_3O_8

tetragonal

U_3O_7

350°C

UO_2

U_3O_8

가 UO_2

150°C

250°C

가

가

U_3O_8

가

가

. 350°C

가

가

. Fig 2

가

350°C

가

8

10 μ m

100 μ m

. 150°C

가

250°C

가

가

dilatometer

, 350°C

.(Fig.

3) 150°C

UO₂

250°C

350°C

segregate

gap

Fig. 2

Fig. 4

150°C

가

가 가

가

(Fig. 5).

2) 150°C

가

가

가

가

150°C

가

가

. Fig. 6

가

가

가

가

가

가

가

U₄O₉

UO₂

(open space)

가

가

가

UO₂

U₄O₉

. U₄O₉

가

가

150°C

4 wt% 가

Fig 7

4 wt% 가 가

. Fig 8 150°C 가

가

4.

가

1) 350°C 가

가

UO₂

가

가

가

2) 350°C 가

UO₂

gap

3) 150°C 가

가 가

가

- [1] A.M. Ross, AECL report 1096, Sep., 1960
- [2] P. Taylor, E.A. Burgess and D.G Owen, J. Nucl. Mater., 88, 153 (1980)
- [3] B.O. Loopstra, J. Acta. Cryst., 17, 651 (1894)
- [4] H. Blank, C. Ronchi, Acta. Cryst., A24, 657 (1968)
- [5] G.C. Allen, P.A. Tempest, Proc. R. Soc. Lond., A406, 325 (1986)

Table 1. Characteristics of ex-DC UO₂ powders

Characteristics	Value
Mean powder size(μm)	4.75
Specific surface area(m^2/g)	2.25
O/U ratio	2.007
Bulk density(g/cm^3)	1.7

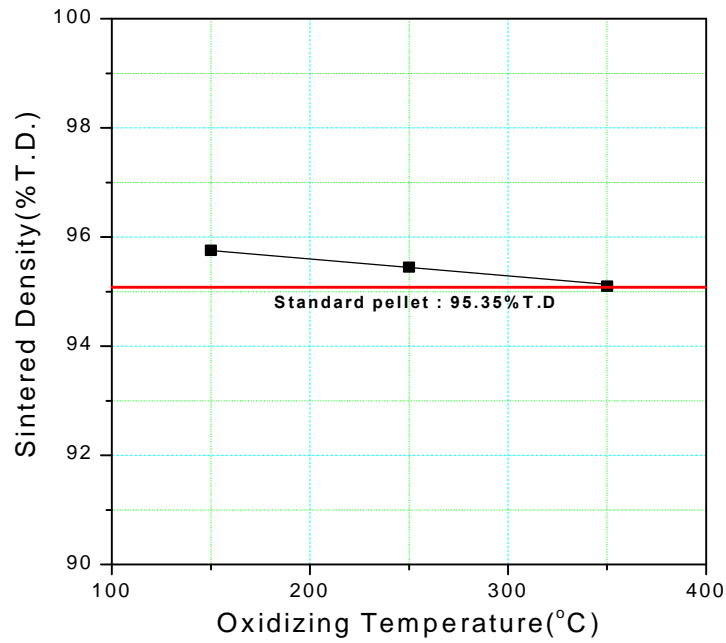


Fig. 1 Variation of sintered density with the addition of powder produced at different oxidation temperature

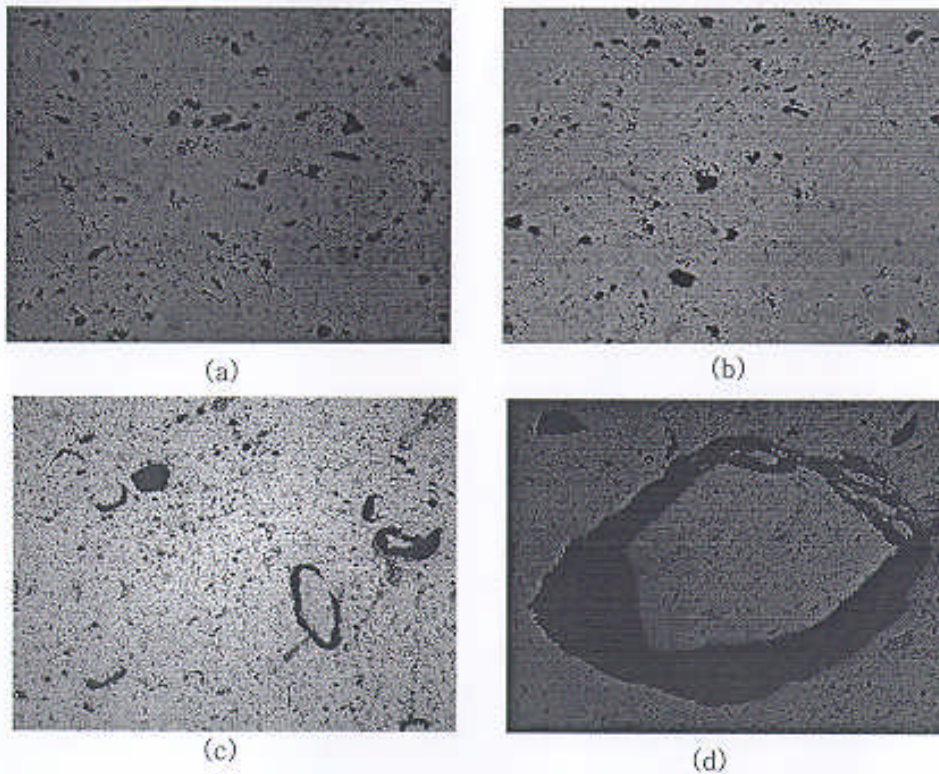


Fig. 2 Microstructural changes of pellets due to the addition of oxidized powder
 (a) UO_2 pellet(x200) (b) 150°C(x200) (c) 350°C(x200) (d) 350°C(x500)

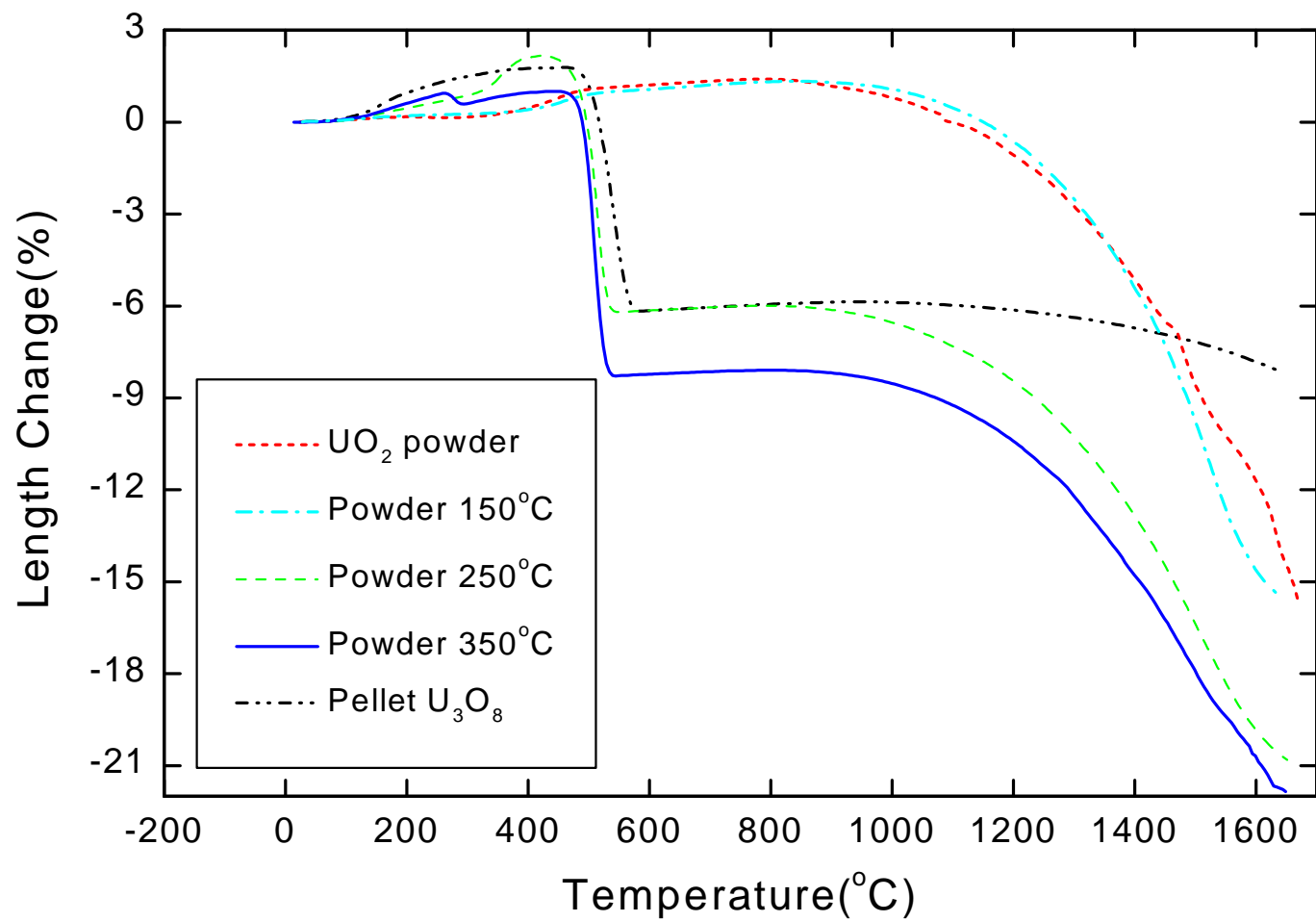


Fig. 3 Results of dilatometer experiments on powders produced at different oxidation temperature

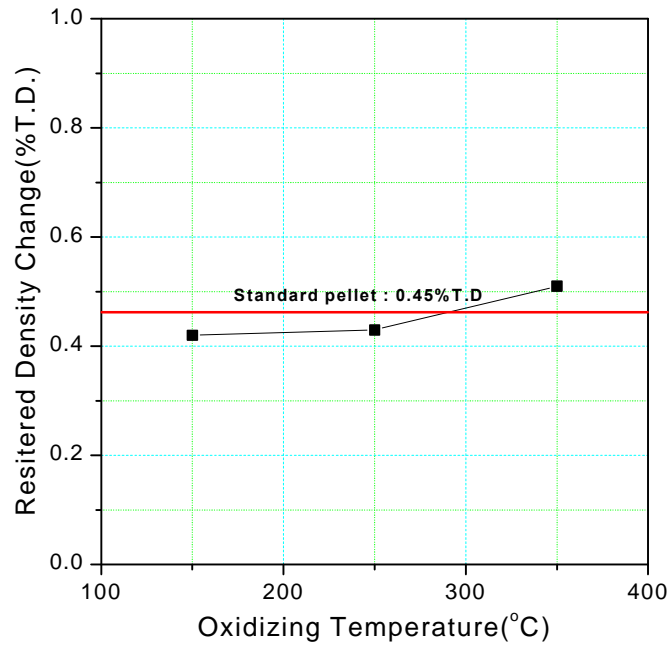


Fig. 4 Variation of resintered density change with the addition of powder produced at different oxidation temperature

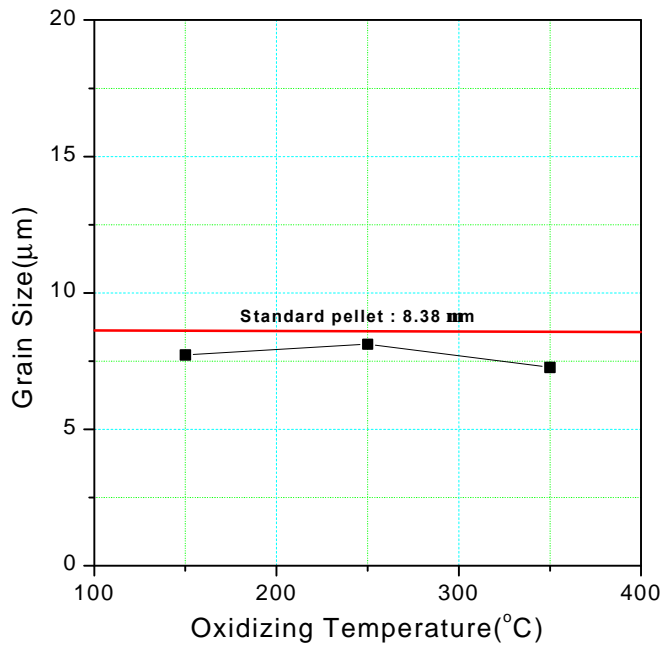


Fig. 5 Variation of grain size with the addition of powder produced at different oxidation temperature

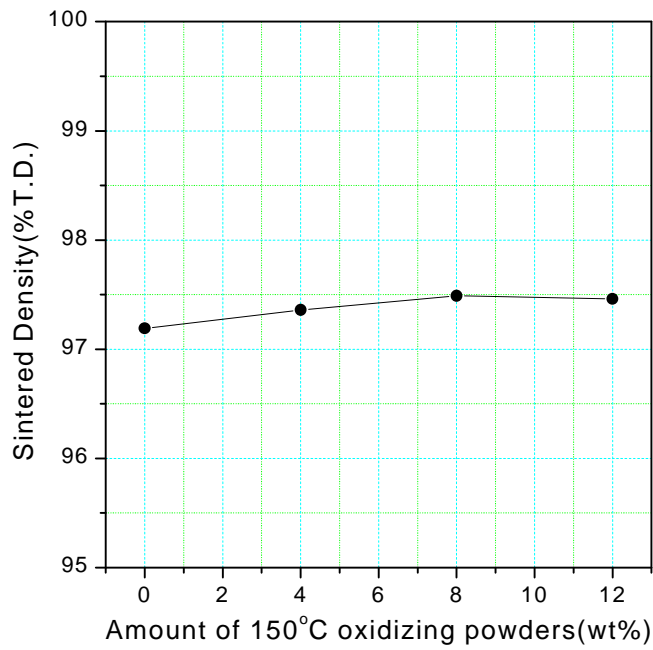


Fig. 6 Variation of sintered density with the amount of powder oxidized at 150°C

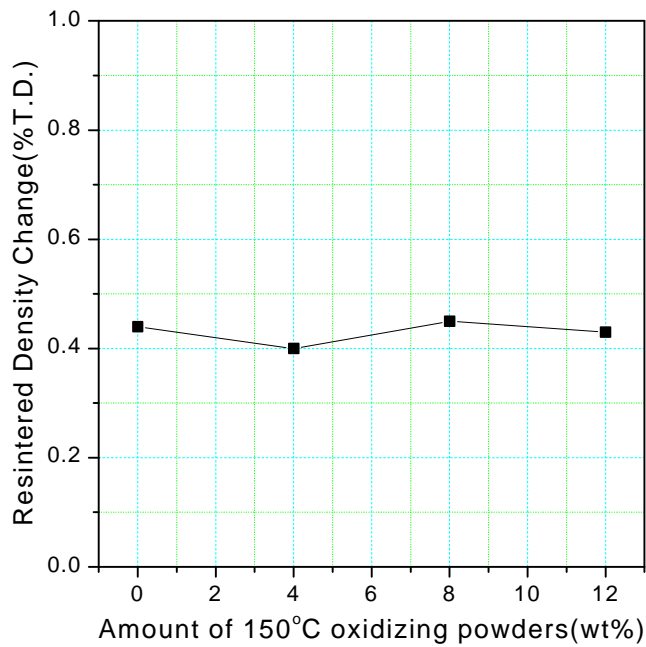


Fig. 7 Variation of resintered density change with the amount of powder oxidized at 150°C

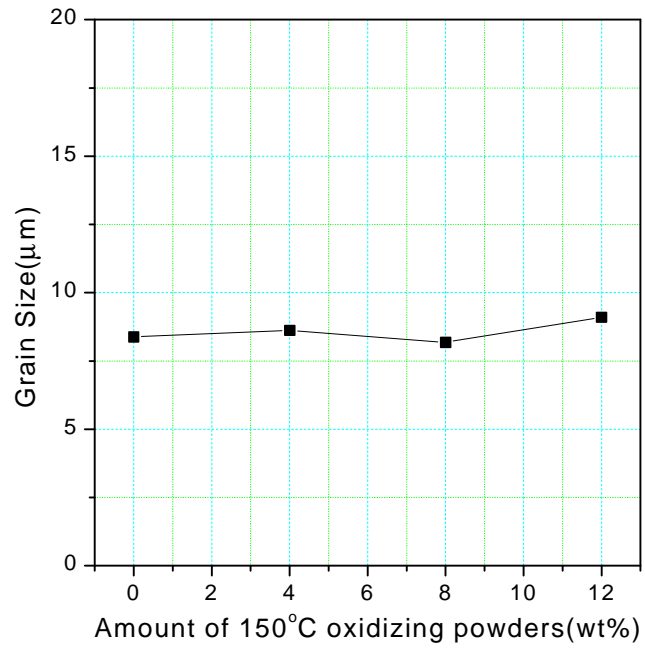


Fig. 8. Variation of grain size with the amount of powder oxidized at 150°C