

## Effect of Various Resintering Atmospheres on Density Changes of $\text{UO}_2\text{-Gd}_2\text{O}_3$ Pellets

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### Abstract

In order to investigate the effect of the furnace atmosphere on the resintering behavior of  $\text{UO}_2\text{-Gd}_2\text{O}_3$  pellets, density changes of  $\text{UO}_2\text{-Gd}_2\text{O}_3$  pellets after resintering under various atmospheres have been measured.  $\text{UO}_2\text{-Gd}_2\text{O}_3$  pellets sintered under  $\text{H}_2\text{-CO}_2$  mixed gas were resintered under dry  $\text{H}_2$  and  $\text{H}_2\text{-CO}_2$  mixed gas, respectively, at the temperature of  $1700^\circ\text{C}$  for 24 hrs. The experiment on  $\text{UO}_2$  pellets were performed at the same conditions for the purpose of comparison. The resintered densities of  $\text{UO}_2$  pellets were increased regardless of atmosphere considered in this study. Those of  $\text{UO}_2\text{-Gd}_2\text{O}_3$  pellets were increased under  $\text{H}_2\text{-CO}_2$  mixed gas atmosphere whereas they were decreased under dry  $\text{H}_2$  atmosphere. This density decrease is mainly caused by the reduction of  $\text{U}^{5+}$  ions to  $\text{U}^{4+}$  under very reducing atmosphere. In addition, the expansion of  $\text{UO}_2\text{-Gd}_2\text{O}_3$  pellet caused by increasing the number of oxygen vacancy whose size is larger than that of oxygen ion is also contributed to such density decrease.

산소포텐셜과 미량 첨가제가  $\text{UO}_2\text{-6wt}\%\text{Gd}_2\text{O}_3$  소결체 특성에 미치는 영향

Effects of Oxygen Potential and Dopant on the Sintering Properties of  $\text{UO}_2\text{-6wt}\%\text{Gd}_2\text{O}_3$  Pellet

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### 요약

산소포텐셜과 미량 첨가제가  $\text{UO}_2\text{-6wt}\%\text{Gd}_2\text{O}_3$  소결체의 밀도, 결정립 크기 및 미세조직에 미치는 영향을 조사하였다.  $\text{Al}(\text{Al}_2\text{O}_3)$ 을 100ppm 첨가한  $\text{UO}_2\text{-6wt}\%\text{Gd}_2\text{O}_3$ 는 건조수분위기에서 낮은 밀도(94.6%)와 작은 결정립(4.2 $\mu\text{m}$ )을 보이는 반면, 기체비( $\text{CO}_2/\text{H}_2$ )가  $3 \times 10^{-2}$  으로 증가하면 밀도와 결정립 크기는 각각 96.2%와 12 $\mu\text{m}$ 로 현저히 증가하고, 그 이상의 기체비 에서는 결정립 크기는 일정하고 밀도는 약간 감소한다.