

Effect of Various Resintering Atmospheres on Density Changes of $UO_2-Gd_2O_3$ Pellets

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Abstract

In order to investigate the effect of the furnace atmosphere on the resintering behavior of $UO_2-Gd_2O_3$ pellets, density changes of $UO_2-Gd_2O_3$ pellets after resintering under various atmospheres have been measured. $UO_2-Gd_2O_3$ pellets sintered under H_2-CO_2 mixed gas were resintered under dry H_2 and H_2-CO_2 mixed gas, respectively, at the temperature of $1700^\circ C$ for 24 hrs. The experiment on UO_2 pellets were performed at the same conditions for the purpose of comparison. The resintered densities of UO_2 pellets were increased regardless of atmosphere considered in this study. Those of $UO_2-Gd_2O_3$ pellets were increased under H_2-CO_2 mixed gas atmosphere whereas they were decreased under dry H_2 atmosphere. This density decrease is mainly caused by the reduction of U^{5+} ions to U^{4+} under very reducing atmosphere. In addition, the expansion of $UO_2-Gd_2O_3$ 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 $UO_2-6wt\%Gd_2O_3$ 소결체 특성에 미치는 영향

Effects of Oxygen Potential and Dopant on the Sintering Properties of $UO_2-6wt\%Gd_2O_3$ Pellet

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요약

산소포텐셜과 미량 첨가제가 $UO_2-6wt\%Gd_2O_3$ 소결체의 밀도, 결정립 크기 및 미세조직에 미치는 영향을 조사하였다. $Al(Al_2O_3)$ 을 100ppm 첨가한 $UO_2-6wt\%Gd_2O_3$ 는 건조수분 분위기에서 낮은 밀도(94.6%)와 작은 결정립(4.2 μm)을 보이는 반면, 기체비(CO_2/H_2)가 3×10^{-2} 으로 증가하면 밀도와 결정립 크기는 각각 96.2%와 12 μm 로 현저히 증가하고, 그 이상의 기체비 에서는 결정립 크기는 일정하고 밀도는 약간 감소한다.