EPMA ANALYSIS OF FISSION PRODUCTS ON IRRADIATED NUCLEAR FUEL

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Metallic precipitates in Irradiated Simfuel with 1800 MWd/MTU were analyzed by EPMA test. Neodymium and lanthanum, which are dissolution in matrix, were distributed homogeneously in irradiated Simfuel. This distribution is important factor in a post irradiation examination. It was observed that concentration of neodymium was locally higher even though it was distributed homogeneously.

In addition, the white inclusion(precipitate) with 1~1.5 ㎛ of dia[1], have been observed in irradiated Simfuel. To find out contents in this precipitate, EPMA is generally used. However, it is difficult to analyze due to tilt of specimen and slight vibration of sample stage on EPMA. Moreover, it is not sure that the 1 ㎛ of beam is transmitted on center of precipitate in specimen.

To analyze the white inclusion after removal of vibration and change to the smallest beam size, beams were transmitted with transverse to 5 points on the precipitate, which is available for trace test of

Oxide. transverse and diffusion couple test of two layers[2]. As a result of EPMA test, composition and structure of white inclusion were different with radius of fuel; compositions were 30.23 at% Mo, 48.25 at% Ru, and 21.5 at% Pd+Rh at center of fuel, 47.34 at% Mo, 46 at% Ru, and 6.65 at% Pd+Rh at surface of fuel, respectively. These structures were hcp structure (α+ε-phase)[3] with 3.883 Å of lattice parameter and 59 $Å^3$ of volume at center, tetragonal structure(ε-phase) with 2.7451 Å and 172 $Å^3$ at surface, respectively.

Based on the method as mentioned above, quantitative tests were completed for metallic precipitates in Simfuels and irradiated fuels. It is concluded that EPMA is available for irradiated fuel to find out metal compositions and structures.

REFERENCES

1. P.G.Lucata, etc., “Preparation and Character of SIMFUEL” Proc. And Int. on CANDU fuel,(1989),132
2. H.KLEYKAMP “The Chemical State of the Fission Products in Oxide Fuels:, J.Nucl.Mater.(1985),221-246
3. H.KLEYKAMP “Constitution and Thermodynamics of the Mo-Ru-Pd Systems”J.Nucl.Mater.(1989)

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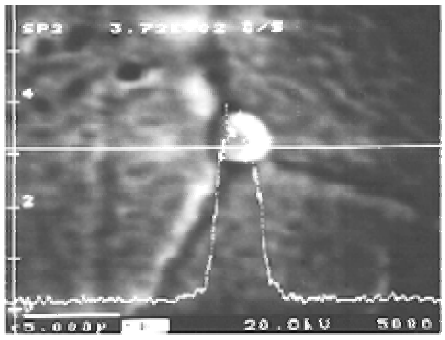

Fig1. White inclusion on the grain boundary

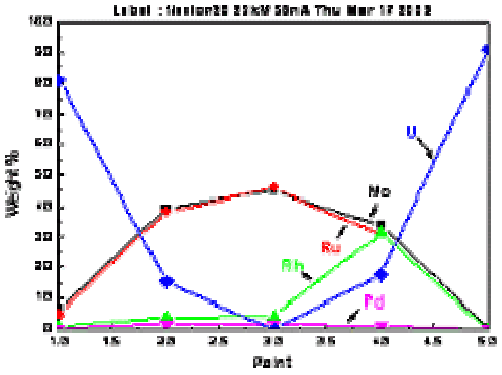

Fig2. Concentration of metallic precipitate

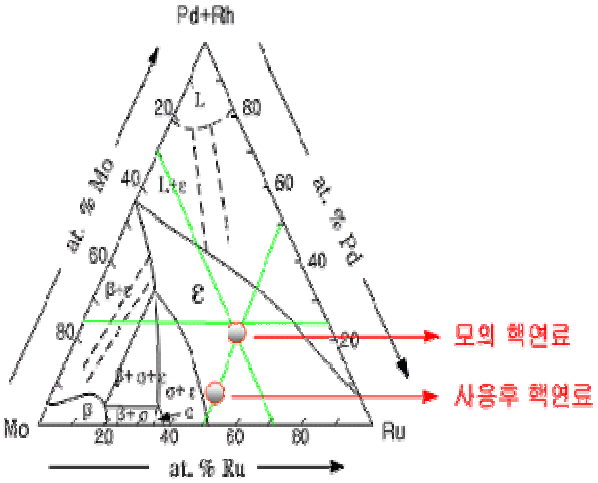

Fig3. Mo-Ru-Pd phase diagram at 1,700 ℃

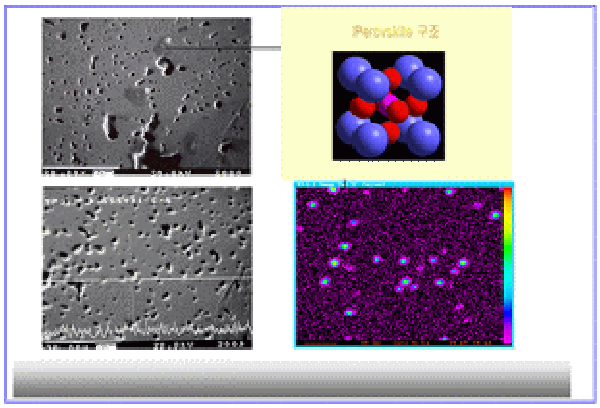

Fig4. Oxide precipitates and Ba Image map

표 1. Concentration of Oxide precipitates

Elements	wt. %	at. %
Ba	43.114	18.96
U	8.962	2.27
Zr	26.234	17.37
O	15.937	60.17
Total	96.515	