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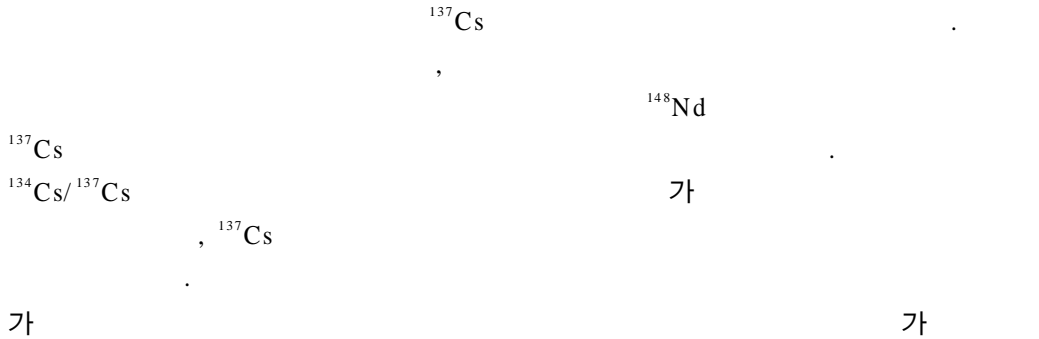
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Measurement of the Burnup Distribution of Irradiated PWR Fuels

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150

가



ABSTRACT

To confirm the burnup distribution of irradiated PWR fuels, the axial and radial distribution of ^{137}Cs intensity of irradiated fuel assembly and rods were obtained by a gamma scanning method. The axial distribution of ^{137}Cs intensity of fuel rod was compared with the burnup data of fuel specimens, which were evaluated by ^{148}Nd analytical method. And a correlation between ^{137}Cs intensity and burnup was derived. By the $^{134}\text{Cs}/^{137}\text{Cs}$ intensity ratio of fuel assembly, the neutron flux distribution in the reactor core was confirmed. The burnups of the axial and radial distribution of fuel rod were decreased at the grid positions and the fuel center, respectively.

1.

가

(1-5)가

Cs 가

^{137}Cs ^{148}Nd

가

2.

가

Ge

4 G23 (: 35.50 GWD/MTU)

4

J09-L01 (: 11.8 GWD/MTU), J09-K01 (:
11.8 GWD/MTU), J12-A13 (: 7.2 GWD/MTU)
(J09-L01, J12-A13)

3 ^{148}Nd

3

가 가 ^{137}Cs 662 keV 가 , ^{235}U ^{239}Pu
 ^{137}Cs 가

^{137}Cs

^{148}Nd

^{148}Nd

^{137}Cs

3.

가.

가 4 G23
 ^{144}Ce ^{154}Eu 1
 ^{134}Cs 605 keV $^{134}\text{Cs}/^{137}\text{Cs}$ 가 $^{134}\text{Cs}, ^{137}\text{Cs}, ^{137}\text{Cs}$ 662 keV
 2 ^{134}Cs 가 2.05 4.3
 D-7 (cycle-7)
 4 3 가 1
 3 G23-G1 ^{137}Cs 5%
 4.5 J09-L01, J09-K01 J12-A 13 ^{137}Cs
 2 가 가 가 J09-L01
 J09-K01 가 가 J12-A 13
 J09-K01 J09-L01 J12-A 13 J09-K01
 26%
 J09-L01 J12-A 13
 ^{148}Nd J09-L01 ^{137}Cs
 6 Y=7.4807X + 25.984 J09-L01
 7 J12-A 13 ^{148}Nd
 + 756.31 ^{137}Cs 8 Y=5.688X
 J12-A 13 9
 10 3 ^{137}Cs 가
 2.5

가 11.2 μm 가 11 8.2 μm 3 μm 가
 가 가 가 가 가 가

4.

가 $^{134}\text{Cs}/^{137}\text{Cs}$ 가 ^{137}Cs
 가 가 10% 가
 가 2.5 ^{137}Cs 가 가 가

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2. S. T. Hsue et al., "Nondestructive Assay Methods for Irradiated Nuclear Fuels," Los Alamos Sci. Lab. Report, LA-6923(1978)
3. R. S. Forsyth et al., "Burnup Determination by High Resolution Gamma Spectrometry : Axial and Diametral Scanning Experiments", Aktiebolaget Atomenergi Report, AE- 267(1967).
4. T. T. Vandergraaf et al., "Burnup Determination of Nuclear Fuels using Neodymium- 148", Atomic Energy of Canada Limited Report, AECL- 5964(1978).
5. 가 , “ ” , KAERI/ CR- 78(1999).

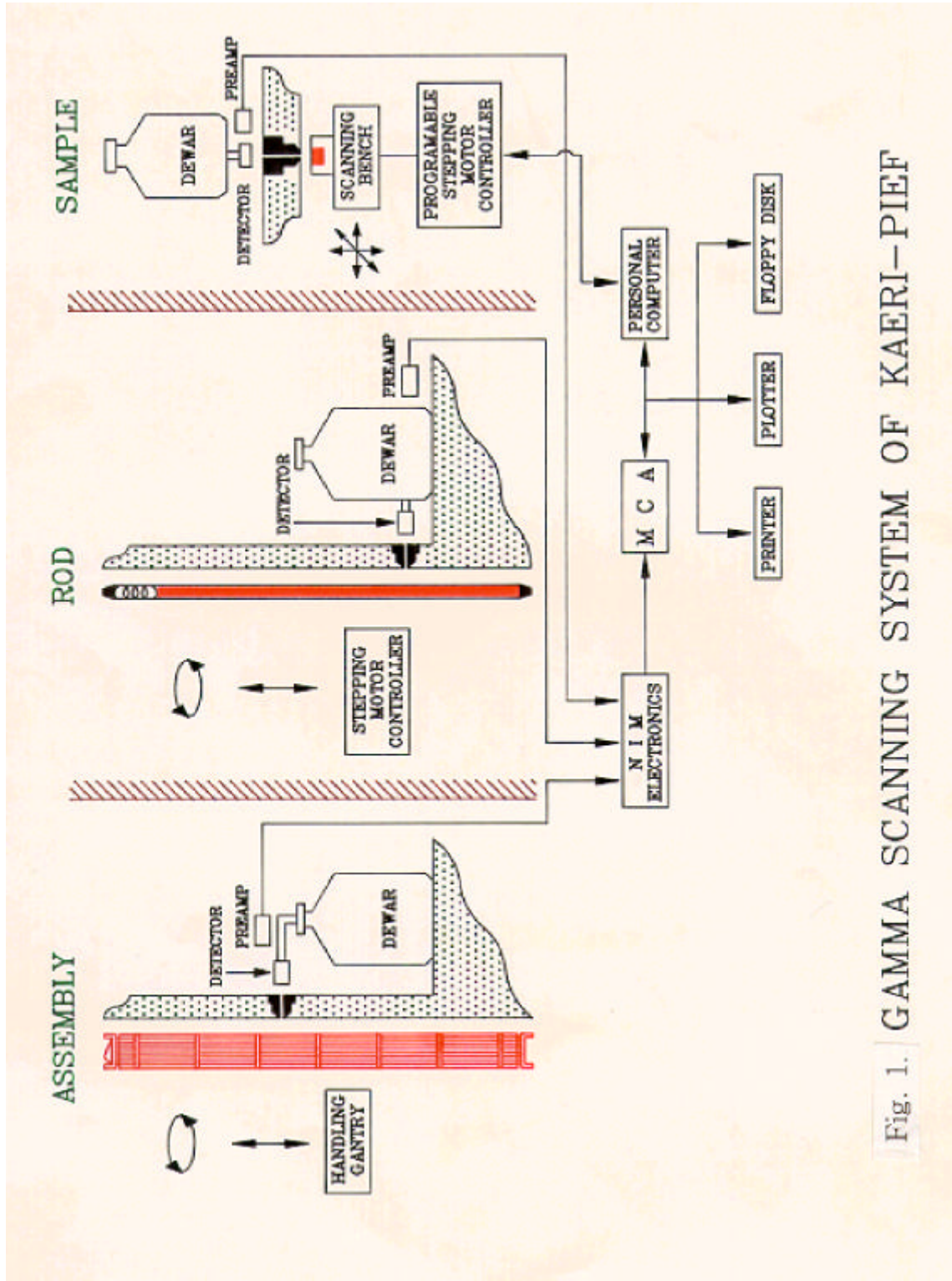


Fig. 1. GAMMA SCANNING SYSTEM OF KAERI-PIEF

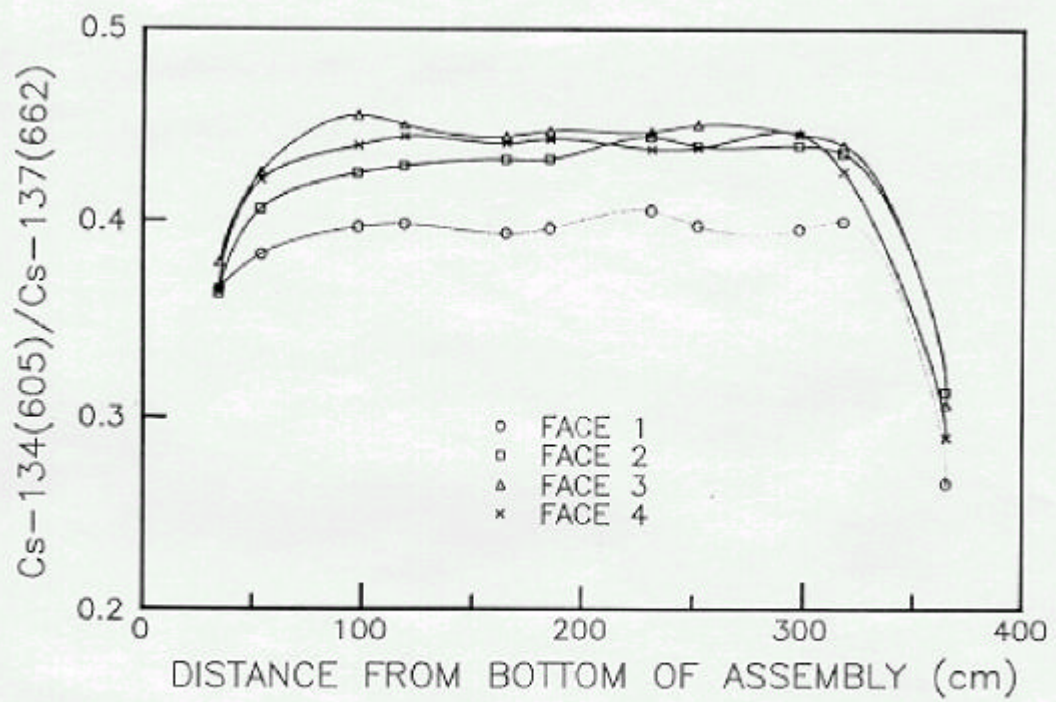


Fig. 2. Axial Distribution of Gamma-ray Intensity of Fuel Assembly G23.

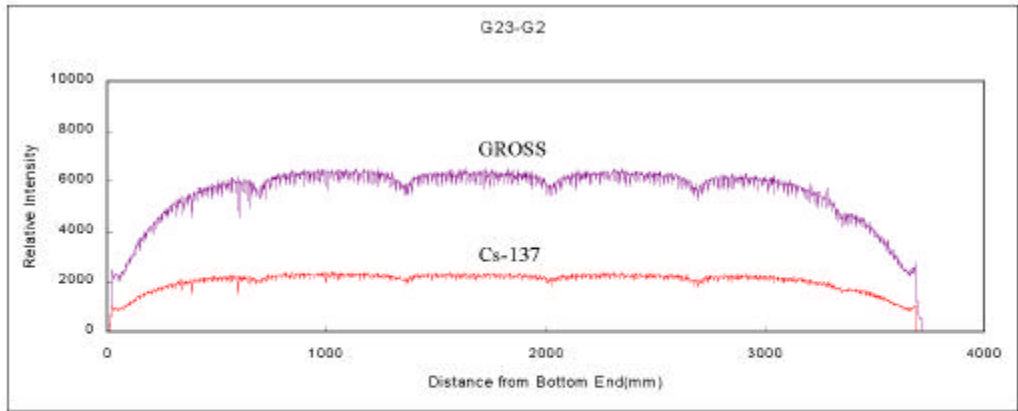


그림 3. G23-G2 핵연료봉의 길이방향 연소도 분포

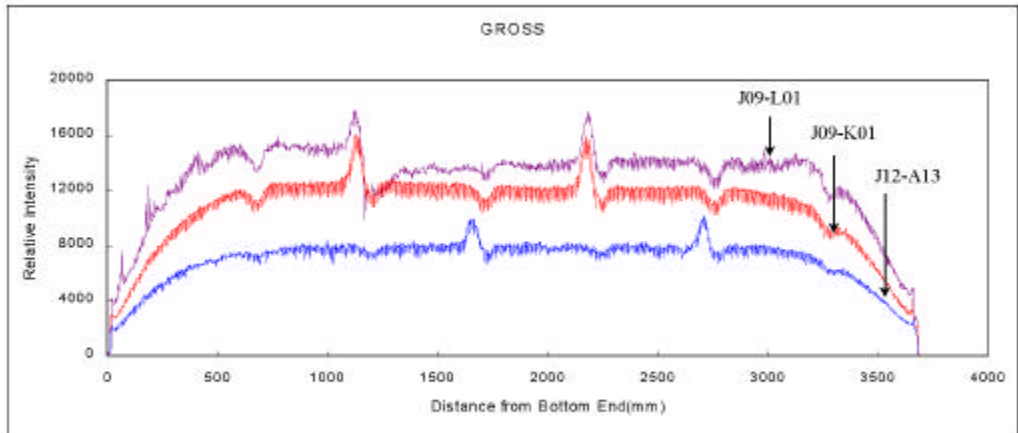


그림 4. 핵연료봉 Gross Gamma Scanning Profile

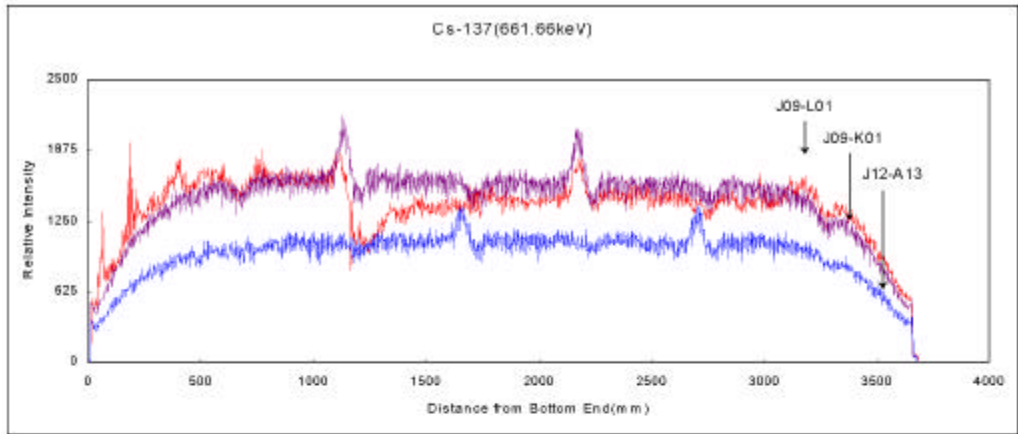


그림 5. 핵연료봉 길이방향 ¹³⁷Cs 감마스캐닝 스펙트럼

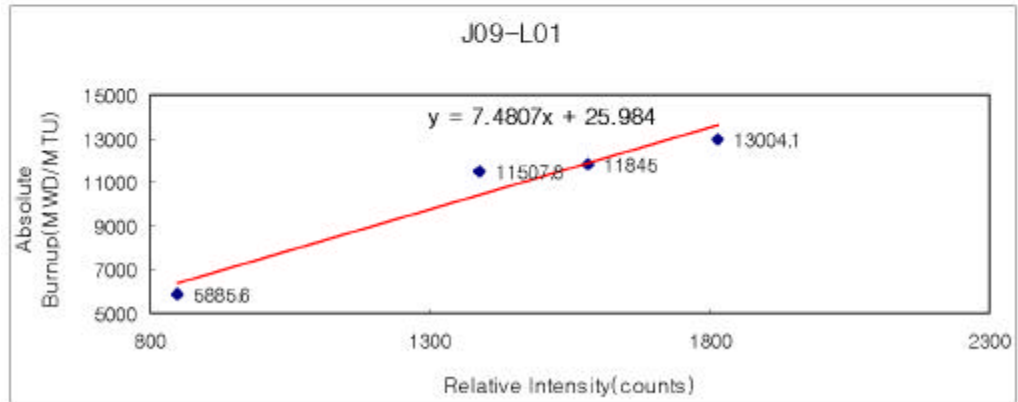


그림 6. Na 경량부식 연소도와 ¹³⁷Cs 감마선세기와의 관계식



그림 7. J09-L01 연료봉의 길이방향 연소도 분포

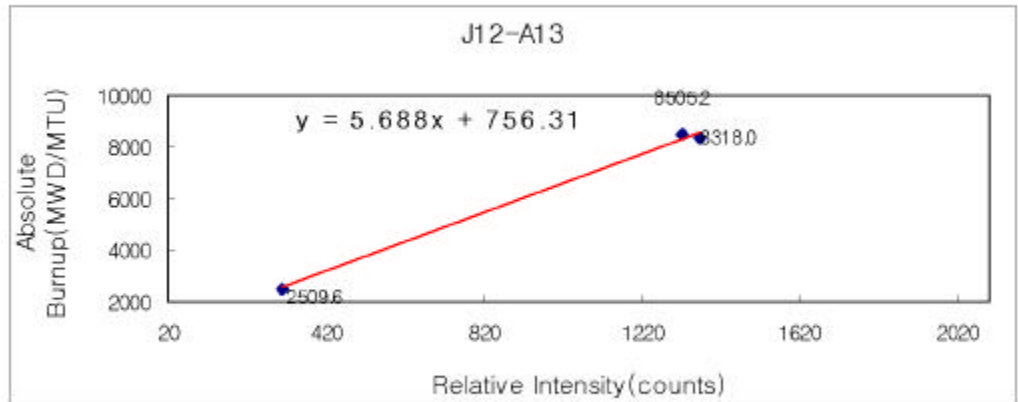


그림 8. Na 정량분석 연소도와 ¹³⁷Cs 감마선 세기와의 관계식

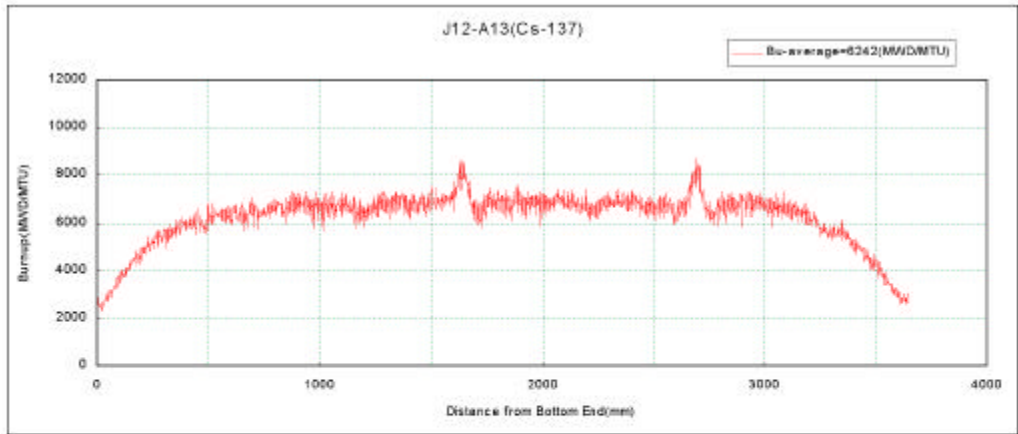
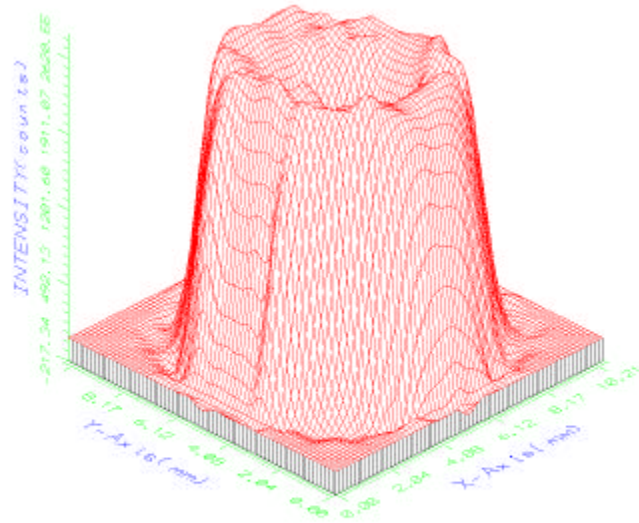


그림 9. J12-A13 연료봉의 길이방향 연소도 분포



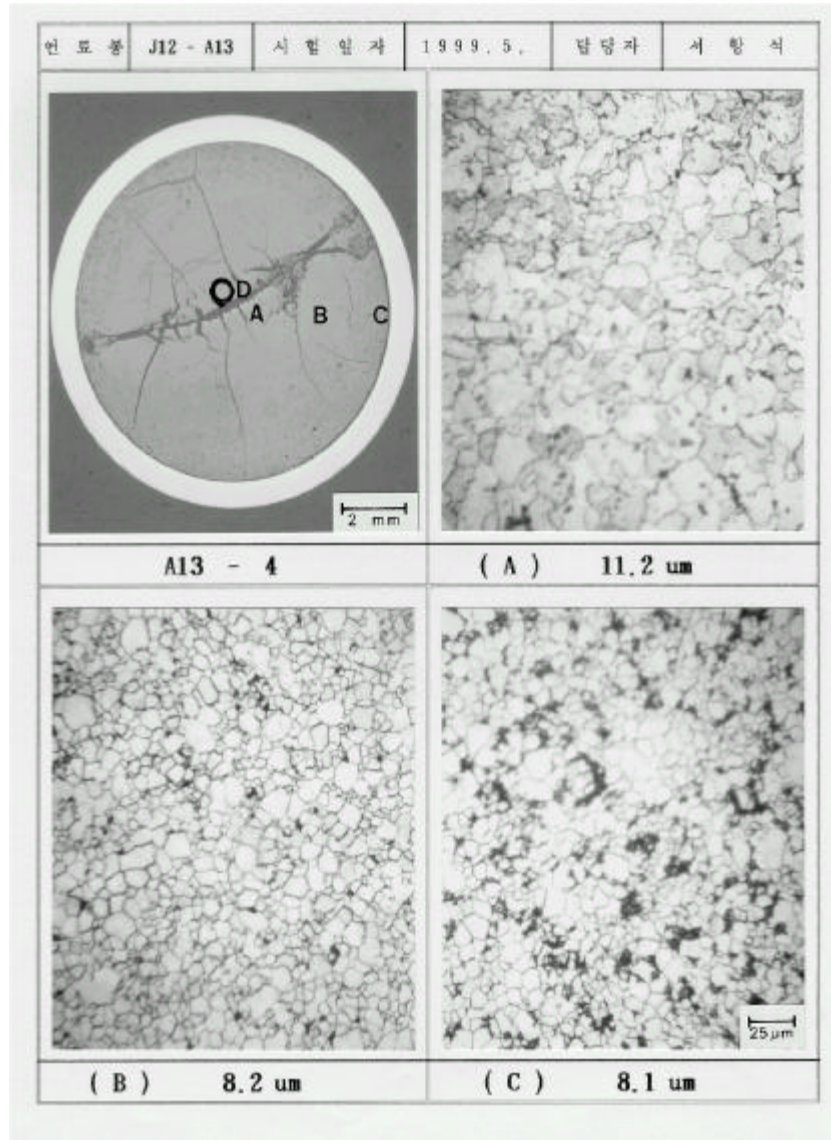


그림 11. 연료봉 하단으로부터 1652mm 위치에서의 연료 단면 미세조직