2000

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Inhomogeneity Property of Zr in the Simulated Metallic Spent Fuel from an Advanced Spent Fuel Management Process

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150

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. (U) (Zr)

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Abstract

An advanced spent fuel management process, based on the pyroreduction technology of PWR spent fuels with molten lithium, is to reduce the storage volume and to lessen the storage cooling load by the removal of highly radioactive decay-heat elements. For success of this process development, the storage safety of the metallized spent fuel is very important. Especially, the element inhomogeneity of the metalized spent fuel can cause the serious accident of storage facility. Some ingots of the simulated metallic spent fuel were fabricated and evaluated by its microstructural property analysis. The inhomogeneity of zirconium in the Simulated Metallic Spent Fuels was also checked by micro-structural and micro-compositional analyses.

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[2,3,4]

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2. -

Elliot [5], Zegler [6], Ageev [7]

. 1 - Elliot ,

0-46.5 at.% Zr 775 °C Zegler

, , X-ray .

36-150 ppm , Elliot

. Miscibility gap 42.4 at.%Zr 693 °C , 29.8

at.%Zr 772 °C . Zegler [6] Ageev [7]

, -U 1.06 at.% eutectoid

0.68 at.% Zr . -U Zr 0.55 at.% -U eutectoid 11.0 at.%

Zr .

3.

.

0, 5, 10, 15 %   .

0, 12.1, 22.5, 31.6 %   .

(1,852 ℃)   ,

2   .   hearth

,   ,

.

.   -   2

EDX   .

100 mg   ,

,

400, 800 Grit   1μm   .

4.

-              2   2

.   2

.   2a   0 %

,   20   50 μm

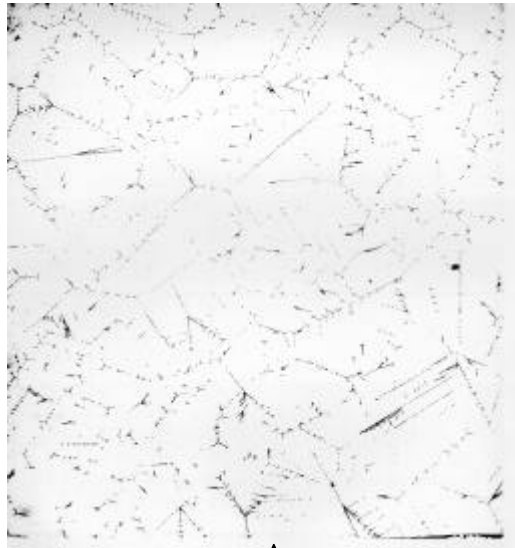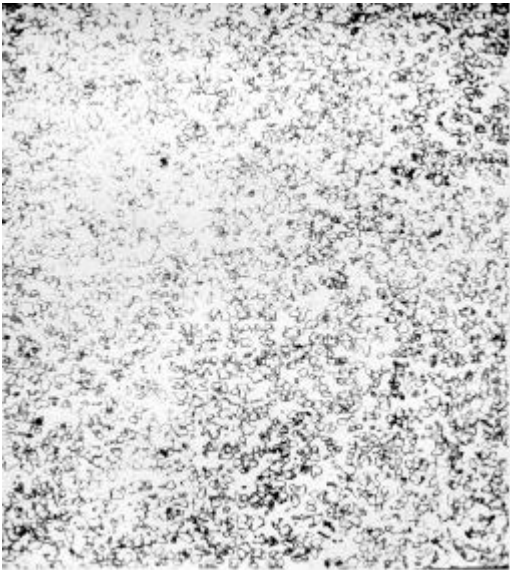.   10   15 %   2b, 2c

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.   -U   0.55 at%

-   .

3   4   -   EDS

.   SEM

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,   15 %   .

,   -

.   5   6   EDS

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,   3

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5.

-          -   2

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-                          5, 10   15 wt%   -   2

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[1]   , "   ", KAERI/TR-994/98
    (1998).
[2]   , "   ,
            ", KAERI/TR-1239/99 (1999).
[3]   , "
              -                            ". '99   ,   , '99. 5. 28-29 (1999).
[4]   , "   ", '99   ,
          , '99. 10. 29-30 (1999).
[5] Elliot, R.P., Constitution of Binary Alloys, Supplement No.1, McGraw-Hill,
    New York (1965).
[6] Zegler, S.T., USAEC Rep. TID-5061 (1951).
[7] Ageev, N.V. (Ed.), Phase Diagrams of Metallic Systems, 1968-1972, Acad. Sci.
    USSR, Moscow (1972).
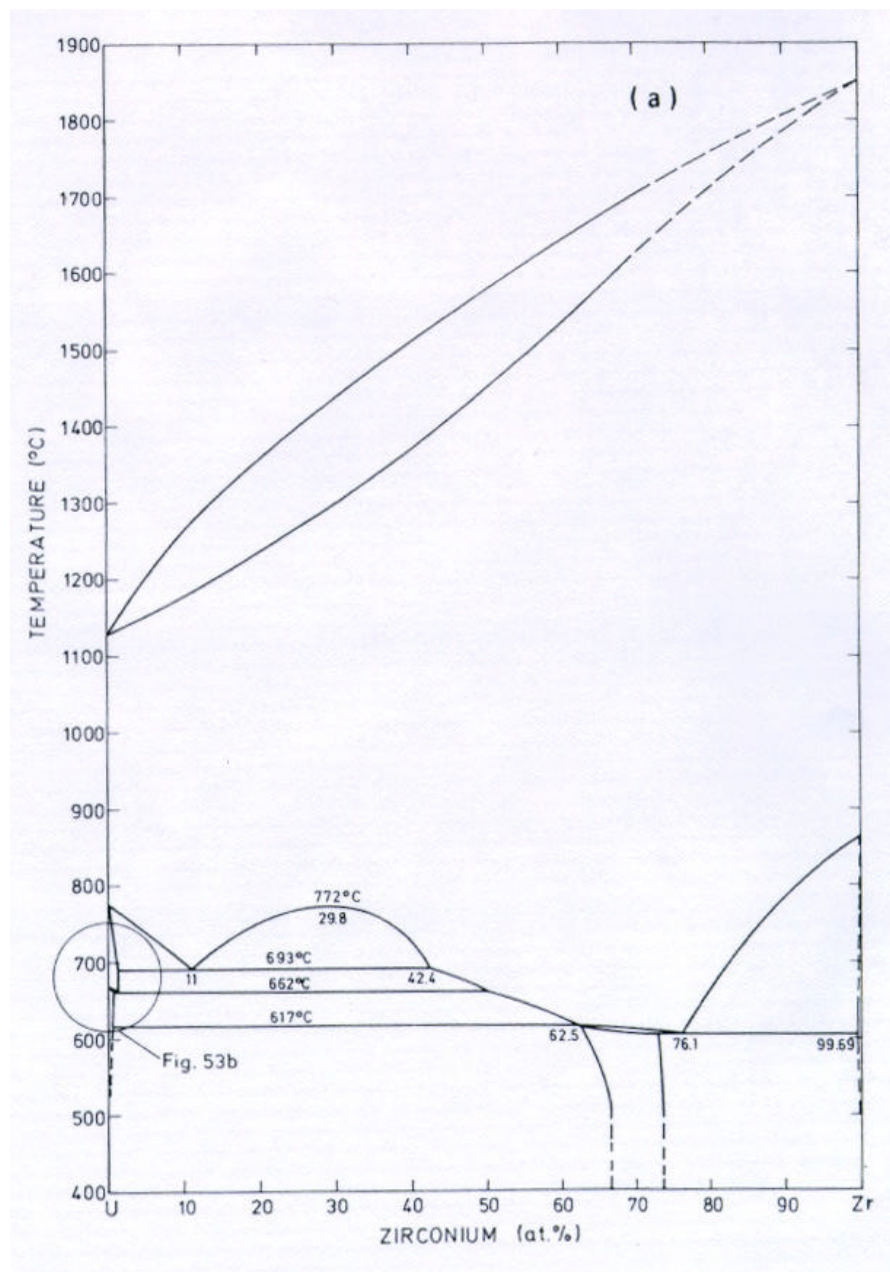
1. U-Zr
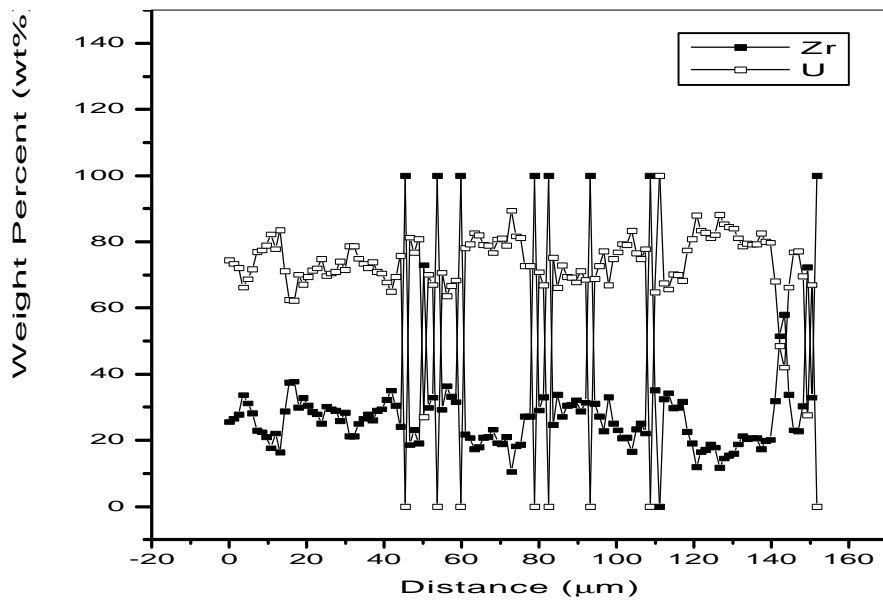
A

B
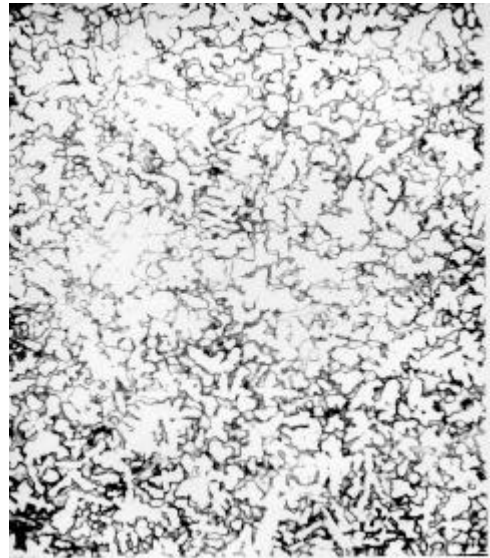
C

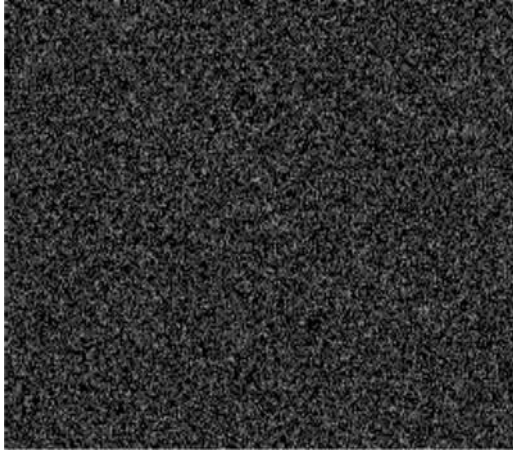2. U-Zr

(A) U-0Zr (B) U-10Zr (C) U-15Zr

A

B

3 U-0Zr(A)   U-5Zr(B)

A

B
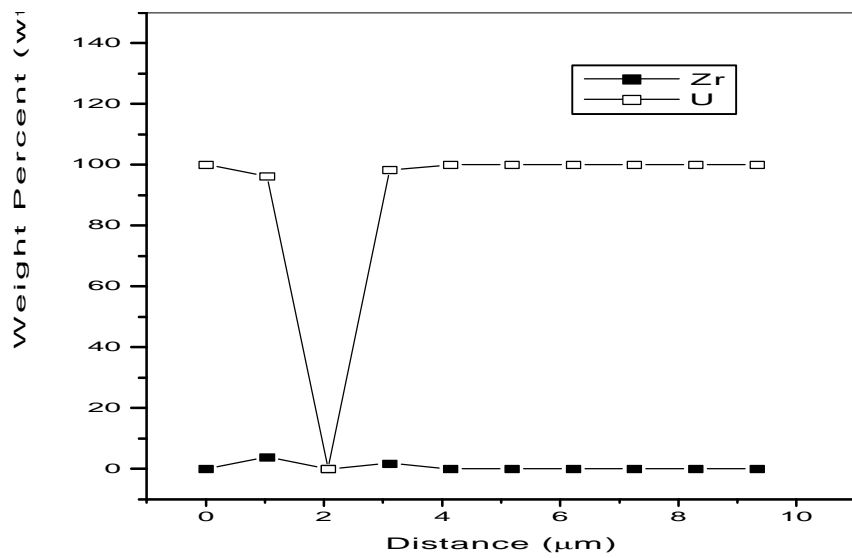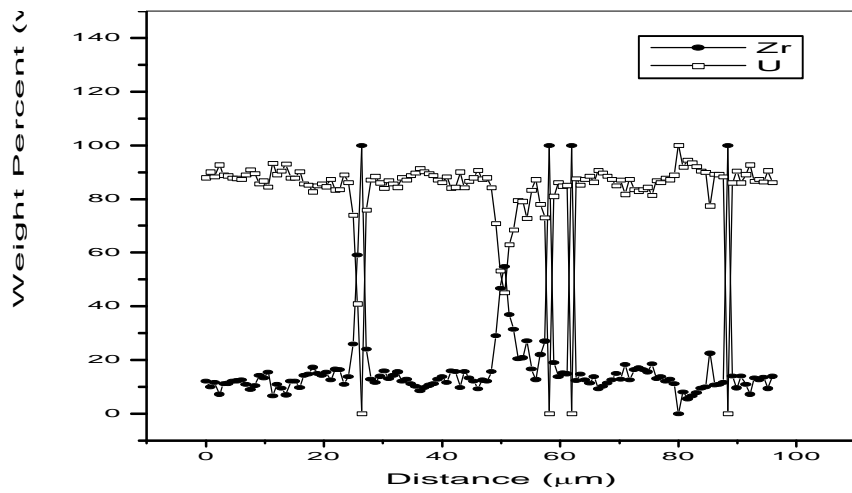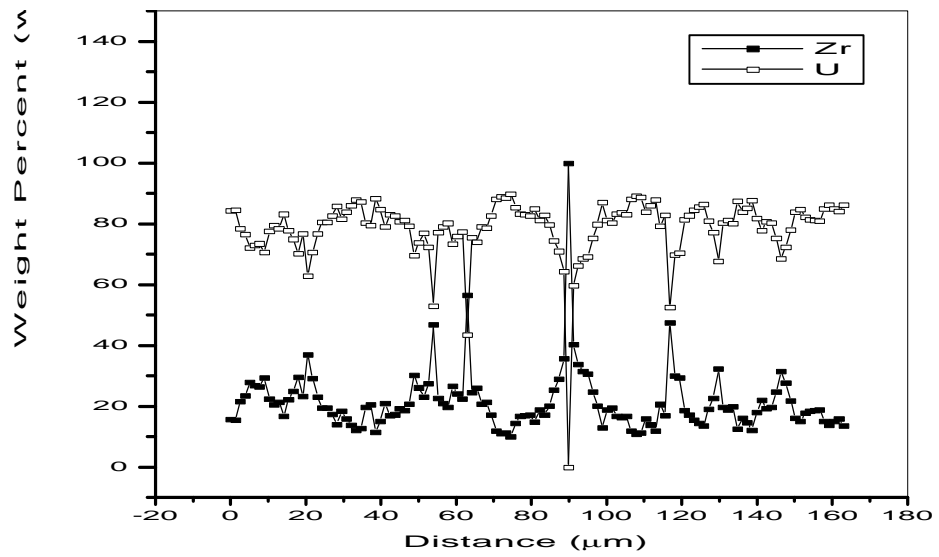
图4. U-10Zr(A)和U-15Zr(B)
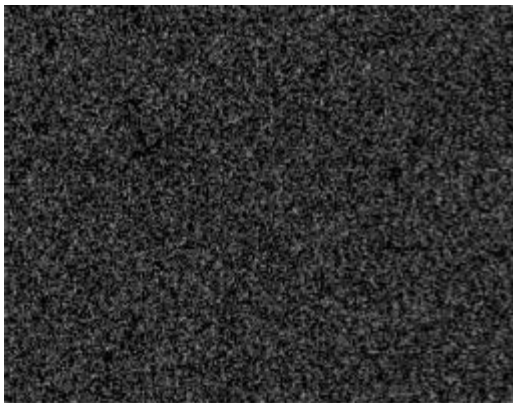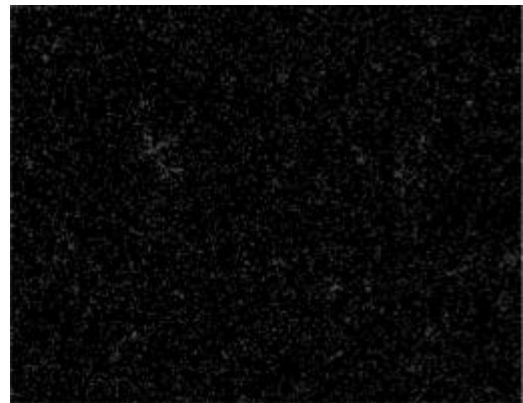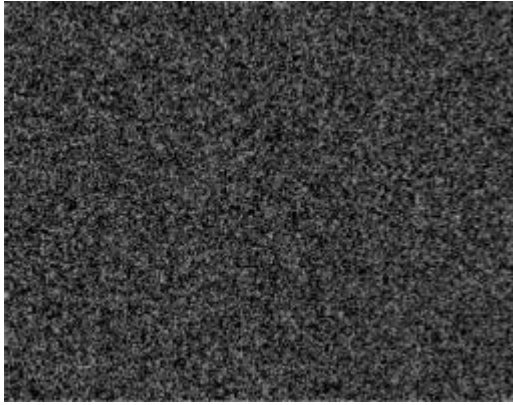
U   Zr

A. U-0Zr

U   Zr

B. U-5Zr

5. U-0Zr（A） U-5Zr（B）
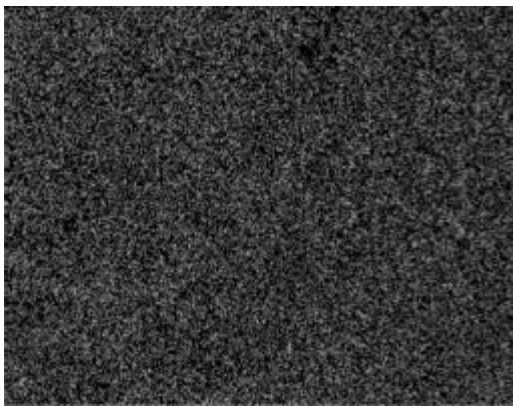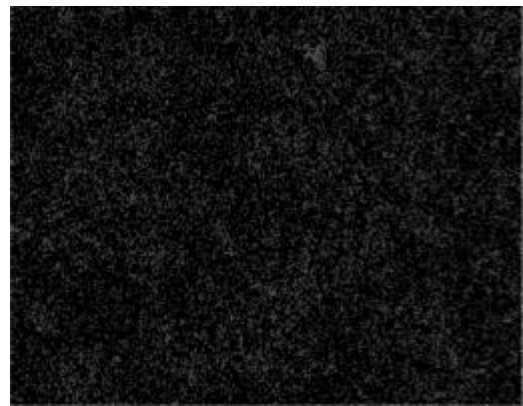
U   Zr

A. U-10Zr

U   Zr

B. U-15Zr

6 U 10Zr(A)   U 15Zr(B)