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OMRE Driver Fuel Element #235 was inserted in the reactor for accumulative reactor exposure of 822.0 Mwd. The element was disassembled and examined at the CDHC facility to provide information for performance analysis.

Cermet Driver Element OMRE #235 was disassembled and a limited examination was performed. During the visual examination of the fuel plates gross deposits were noted on fuel plates #1 and #2 and appeared to have caused some restrictions, however, the flow channels in and around the other fuel plates showed no obstruction. With the exception of fuel plates #1 and #2, no other distortion or other peculiarities were noted. A sample of the gross deposit from plate #1 was obtained for chemical analysis.
I. INTRODUCTION

The thermocoupled cermet driver fuel element #235 received a partial examination in the CDHC facility following irradiation at the OMRE. This report contains the observations that were made during the examination.

II. ELEMENT DESCRIPTION

A. Component Description

Fuel element #235 contained sixteen stainless steel clad fully enriched UO₂ stainless steel cermet fuel plates.

The containment box and end hardware were fabricated of type 304 stainless steel. Five thermocouples were provided to measure element temperature, recorded temperatures from thermocouples #183 and #185 (See Figures 1 and 2) are included in this report.

No other instrumentation or special apparatus was provided on this element.

B. Exposure History

Cermet test element #235 was inserted in location #9 Core III-B on 7-12-62 and was irradiated through the end of Core III-C, 4-3-63, and was removed. The integrated reactor exposure record vs time and power level are shown in Figures 5 and 6.

III. HOT CELL EXAMINATION (CDHC)

A. The element was received at CDHC in August of 1963 and removed from the shipping cask and unloaded by standard techniques into Cell #3. The element, after two days' dry storage, was then placed into a can containing tetrahydrofuran. After a two-hour-soak, the element was raised into the air and suspended for photography. (See Figure 7).

B. In-Cell Examination

1. Preliminary box inspection.

Before any work was initiated reference identification of the element sides was made as shown in the plan sketch below:

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Side #3

Fuel Plate #1

Conduit Stub
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The appearance of the outer surface of the fuel element was quite similar to other stainless cermet and experimental elements. Generally, blackened with a thin brittle film.

Measurements of the box were obtained using calipers. (See Table I). These measurements showed no bulging or distortions with values obtained ranging from 2.809 to 2.825 inches. These measurements seemed to corroborate measurements obtained from past undistorted OMRE fuel elements. Inconsistencies in the measurements are due to the variables in the weld seam running the length of the box section.

2. End hardware and box removal
The upper and lower end hardware was removed by use of an electric hacksaw. After removal, a visual inspection through the flow channels showed a restriction between side #2 and fuel plates #1 and #2. All other channels appeared clear of obstruction.

The fuel plate tabs and spacer bars were cut by a milling machine operation. The stainless steel fuel box was then split by milling the corners between sides #2 and #3 and between sides #1 and #4. Some difficulty was encountered in separating the fuel plates from the box section. As a result, remilling of one tab and spacer bar was performed. Consequently, due to excess handling, some of the film on the fuel plates was probably shaken loose. A puller was then used to free the spacer bar. All the fuel plates with the exception of #1 fuel plate were readily removed from the box section.

Fuel plate #1 was stuck firmly in the fuel plate groove on side #1 and was forcefully removed. The fuel plate was slightly bent during this operation. An illustrated figure showing the deposits, thermocouples, and general fouling film pattern on fuel plate #1 is presented in Figure 8.

During the stereomicroscope examination of the grooves on side #1 of the fuel element box, the following observations were made. There was no appreciable deposit in groove #1 but a thin hard film which indicates intimate contact between the fuel plate and the box. There was a hard packed deposit in groove #2 which varied in thickness from 1/3 to 1/2 of the groove depth. This indicates that the deposit was formed and subsequently packed by the fuel plate. There was a deposit in the third groove which was beady in nature and approximately 1/3 of the groove depth in thickness. This deposit indicated no contact or very little contact with the fuel plate.

These observations are in general agreement with those...
of Reference #3 and tend to corroborate the failure mechanism postulated for the COBRA fuel element.

3. The fuel plates were placed on a plywood rack and photographed on both sides. Photographs of the fuel plate and inside of the fuel box section are shown in Figure 9.

4. A Sample for chemical analyses was obtained of the heavy deposits found nineteen inches from the inlet end in the box section after fuel plate #1 had been removed. Results of the chemical analysis were not available at this writing.

IV. CONCLUSION

Fuel plates #1 and #2, which faced the center of the core, had the heaviest build-up of deposits. The other fourteen fuel plates, for the most part, were covered with a light black film. Examination of the grooves on side #1 of the fuel element box showed a variable deposit pattern which would tend to support the theory of fuel plate differential expansion. (See Reference #3).
V. REFERENCES

(1) IOL from R. J. Mack to R. B. Varnes dated 2-2-63. "OMRE Power Levels"

(2) NAA-SR-TDR 8619, "Post-Irradiation Examination of OMRE Experimental APM-UO2 Fuel Element No. 4", by N. J. Swanson, dated 6-14-63.

OMRE 7-3 BOX DIMENSIONS

<table>
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<tr>
<th>SIDES 1 &amp; 2</th>
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TABLE #1
OMRE CORE III-B and III-C

Temperature vs MWD
For Fuel Element No. 235
Thermocouple No. 185

Elapsed Time (MWD)

FIGURE 2
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OMRE 7-3
ELEMENT (235)

SIDES

1

2

OUTLET END

3

4