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AUTHOR

R. A. Schneider

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NEPTUNIUM-237 CONTENT OF E-METAL

by

R. A. Schneider

Process Chemistry
Research and Engineering
Chemical Processing Department

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RICHLAND, WASHINGTON

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NEPTUNIUM-237 CONTENT OF E-METAL

An analytical program was carried out to obtain an accurate single point measurement of neptunium-237 content versus exposure for E-metal. Two large volume dissolver solution samples representing E-metal from the KW, KE, C, and DR reactors were obtained from the Redox Plant for the basis of analysis. The neptunium-237/U ratio was determined by direct analysis, and the exposure was estimated from the measured Pu/U ratio and the uranium-235 burn-out. The analytical results are shown in Table I.

TABLE I

NEPTUNIUM-237 CONTENT OF E-METAL

<u>Aliquot Number</u>	<u>Np-237/U</u> <u>g/T</u>	<u>Pu/U</u> <u>g/T</u>	<u>U-235</u> <u>Wt. %</u>	<u>MWD/T⁽¹⁾</u> <u>by Pu/U</u>	<u>MWD/T⁽¹⁾</u> <u>by U-235</u>
1	2.58	530	0.8597	712	727
2	2.40	"	"	"	"
3	2.70	"	"	"	"
4	2.77	"	"	"	"
5	2.58	"	"	"	"
6	2.66	"	"	"	"
7	2.52	"	"	"	"
8	2.73	"	"	"	"
9	2.88	"	"	"	"
10	2.72	"	"	"	"
11	2.88	"	"	"	"
12	2.68	"	"	"	"
13	2.77	"	"	"	"
14	2.81	"	"	"	"

$\bar{X} = 2.69$

$\sigma = 1.3\%$

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(1) Exposure obtained from Pu/U ratios and U-235 burn-out using the values given in HW-50300-B.

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As shown by the data in the Table, the Np-237 content was found to be 2.69 grams per ton U at an estimated exposure of 727 MWD/T U. The standard deviation of the reported Np/U ratio was 1.3%. The measured U-235 burn-out was taken as the best basis for the MWD/T U. As back-up data, the Pu/U measured ratio was used as the basis for estimating an MWD/T U value of 712. HW-50300-B was used for converting analytical values to MWD/T U.

Neptunium-237 concentration was determined by alpha counting; after separation from other alpha emitters by a series of solvent extractions using TTA (thenoyl-trifluoroacetone) and T10A (tri-iso-octylamine). A total of 27 aliquots of dissolver solution were used for Np-237 analysis. Ten aliquots were spiked with standard Np-237 and 17 aliquots were not spiked. A spike recovery of 99.4 % was obtained and the results corrected accordingly. Three results were discarded as flyers at the 2.5 sigma level, yielding total of 14 values which were averaged to obtain the reported Np/U ratio.

Plutonium, uranium, and uranium-235 were determined by standard analytical methods having precisions many times better than the neptunium method.

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