[redacted] PER DOC REVIEW JAN. 1973

A-84-019, 57-9

Metallurgical Laboratory

August 5, 1944

1981

E. Bruce Ashcraft

H. L. Anderson

[redacted]

Analysis of Material Used in Neutron Cross-section Measurements

We have just completed some careful neutron measurements on three materials: thorium metal, uranium metal, and uranium oxide depleted thirty times in 25. We should be grateful if you would carry out a chemical analysis on these materials so that we can correct for the effect of any impurities which might be present.

On the Th metal sample, we carried out a measurement of the total cross-section scattering plus absorption obtaining the result 19.8 B (B = 10^{-24} cm^2 per atom). We are anxious to know whether this result can be too high by more than .1 B.

Accordingly, I am adding a list of elements with the number of parts per million by weight which will contribute .01 B. The material is reputed to be quite pure, but since it was produced by sintering, we fear that not negligible amounts of H might be present. You will notice from the table that only 1 ppm of H will make the result too high by .01 B.

In order to simplify the work of analysis, I assume that you would first make an assay of Th element in the material. If the assay shows that the material is better than 99.9% pure, then it will be unnecessary to analyze for a large number of the elements. There are, however, some elements of which even a very small amount will give an appreciable error.

I have divided these elements into two groups. In Group I, I have placed the most dangerous elements for measurements of the total cross-section, and for which a careful analysis is needed. I have listed the number of ppm which would give a contribution of .01 B to the measured result. This number corresponds to the accuracy to which it is required to know the amount present.

On the U metal sample, we carried out a total cross-section measurement and obtained 15.3 B. The analysis for U should be carried through in the same way as was outlined for Th.

In the case of the depleted oxide, the effects of scattering are unimportant. We measured the absorption cross-section and found 2.55 B. A separate list is provided for the oxide analysis. In addition, we should like an estimate of amount of water in the sample.

I am sending about 20 grams of each sample. The depleted oxide sample is particularly valuable; and if some is not used, I would appreciate having it returned to me. I hope you will be able to complete the analysis in one month's time.

2197 0265

[redacted]

CLASSIFICATION CANCELLED PER DOC REVIEW JAN. 1973

VERIFIED UNCLASSIFIED PUBLICLY RELEASABLE LANL Classification Group

H. L. Anderson
Section Chief
Nuclear Physics Div.

[redacted]

[redacted]

Metallurgical Laboratory

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

TH AND U METAL

GROUP I - Most Dangerous Elements for Total Cross-section Measurements

Element	ppm which gives .01 B of total cross-sec. per atom of U or Th. This is the limit of accuracy required in the analysis.
H	.84
Li	4.2
B	.64
Cd	1.57
Sm	1.1
Eu	2.6
Gd	.26
Dy	8

COPY

GROUP II - Less Dangerous Elements for Total Cross-section Measurements

Element	ppm which gives .01 B of total cross-sec. per atom of U or Th. This is the limit of accuracy required in the analysis.
Be	62
C	105
N	48
O	164
F	195
Cl	41
Mn	152
Fe	195
Ni	132
Co	71
Rh	28
Ag	71
In	25
Se	118
Br	27
Tm	64
Lu	38
Hf	60
Ir	22
Au	82
Hg	21

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

[redacted]

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

Metallurgical Laboratory

[redacted]

UNCLASSIFIED

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

U OXIDE [redacted]

GROUP I - Most Dangerous Elements for Absorption Cross-sec. Measurements

Element	ppm which gives .001 B of absorp. cross-section per atom of U oxide. This is the limit of accuracy required in the analysis.
Li	.8
B	.1
Cd	.3
Sm	.2
Eu	.5
Gd	.05
Dy	1

COPY

GROUP II - Less Dangerous Elements for Absorption Cross-sec. Measurements

Element	ppm which gives .001 B of absorp. cross-section per atom of U oxide. This is the limit of accuracy required in the analysis.
K	30
Cl	9
Mn	30
Co	20
Rh	6
Ag	15
In	5
Se	40
Hf	5
Ta	10
Lu	8
Nd	10
Ir	4
Au	15
Hg	4

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

[redacted]

This document contains information affecting the National [redacted] the Espionage Act, [redacted] 31 and 32. Its transmission or [redacted] to an unauthorized person is prohibited by law.

UNCLASSIFIED

2197 0267