

40-8948

**ORISE**  
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

June 28, 1996

Mark Thaggard  
U.S. Nuclear Regulatory Commission  
Mail Stop: T7D13  
Washington, DC 20555

**SUBJECT: DATA RESULTS OF SAMPLES FROM SHIELDALLOY METAL,  
CAMBRIDGE, OHIO (RFTA NO. 96-21)**

Dear Mr. Thaggard:

Attached are 4 tables containing the alpha and gamma spectroscopy results for the 7 samples from the ShieldAlloy site. Tables 1 and 2 present the alpha and gamma spectroscopy results for thorium. Tables 3 and 4 list the alpha and gamma spectroscopy results for uranium. The results do not completely agree with each other due in part to the presence of the daughters of U-235, specifically Pa-231, at higher than normal levels of activity. These U-235 daughters interfere with the chemistry of thorium and with the proper identification and quantification of U-235 by gamma spectroscopy. In addition, there appears to be high atomic number (Z) material present in at least one sample based on the fact the U-238 activities quantified by the gamma lines of Th-234 and Pa-234m do not agree. The isotopic uranium results in Table 3 do indicate that the uranium is present at natural isotopic abundances.

The thorium analysis of EPSL-10 was not finished due to matrix interferences that could not be resolved during the chemical processing. The analysis was attempted three times yielding unreadable alpha spectra each time. There was clearly thorium present but the peaks could not be resolved. The thorium results for WPSL-61 are underestimated due to a high Th-229 tracer recovery value caused by the interference of Pa-231. This sample was analyzed twice and the Pa-231 interference could not be resolved.

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If you have any questions, call me at (423) 241-3242 or Mark Laudeman at (423) 576-3561.

Sincerely,

*Dale Condra*

Dale Condra  
Technical Resources Manager  
Environmental Survey and Site  
Assessment Program

DC:dka

Enclosure

cc: R. Uleck, NRC/NMSS/7F-27  
D. Tiktinsky, NRC/NMSS/T-8A23  
J. Kotton, NRC/REGION I  
W. Beck, ORISE/ESSAP  
E. Abelquist, ORISE/ESSAP  
M. Laudeman, ORISE/ESSAP  
File/627

**TABLE 1**  
**THORIUM ALPHA SPECTROSCOPY RESULTS**

SAMPLE ID	Radionuclide Concentration (pCi/g)		
	Th-230	Th-232	Th-228
EPSL-06	8435.0 ± 441.2 <sup>a</sup>	8.2 ± 8.2	34.9 ± 17.1
EPSL-10	No Analysis	No Analysis	No Analysis
EPSL-11	299.7 ± 24.8	2.63 ± 0.6	2.6 ± 0.6
WPSL-31A	7394.0 ± 395.1	10.3 ± 9.2	26.8 ± 15.0
WPSL-61	4.5 ± 1.0	0.1 ± 0.2	0.1 ± 0.3
001CHF	4.5 ± 0.5	0.2 ± 0.1	0.5 ± 0.1
005CHF	4.5 ± 0.5	0.4 ± 0.1	0.6 ± 0.1

<sup>a</sup>Uncertainties represent the 95% confidence level, based only on counting statistics.

**TABLE 2**  
**THORIUM GAMMA SPECTROSCOPY RESULTS**

SAMPLE ID	Radionuclide Concentration (pCi/g)		
	Th-230 <sup>b</sup>	Th-232 <sup>c</sup>	Th-228 <sup>d</sup>
EPSL-06	8445.0 ± 321.0 <sup>a</sup>	<6.9	<2.6
EPSL-10	296.6 ± 164.7	256.7 ± 12.7	267.0 ± 4.6
EPSL-11	281.4 ± 108.7	<1.1	<1.2
WPSL-31A	8973.0 ± 136.4	<1.5	<0.7
WPSL-61	<136.6	<1.0	<0.9
001CHF	<9.9	<0.5	0.5 ± 0.2
005CHF	<10.8	0.5 ± 0.3	0.4 ± 0.1

<sup>a</sup>Uncertainties represent the 95% confidence level, based only on counting statistics.

<sup>b</sup>Th-230 is identified by a gamma line at 67.6 keV.

<sup>c</sup>Th-232 is identified by a gamma line at 911.1 keV from its daughter, Ac-228.

<sup>d</sup>Th-228 is identified by a gamma line at 238.6 keV from its daughter, Pb-212.

**TABLE 3**  
**URANIUM ALPHA SPECTROSCOPY RESULTS**

SAMPLE ID	Radionuclide Concentration (pCi/g)		
	U-234	U-235	U-238
EPSL-06	49.8 ± 4.6 <sup>a</sup>	2.2 ± 0.8	51.7 ± 4.8
EPSL-10	297.4 ± 40.6	22.9 ± 5.5	326.4 ± 44.3
EPSL-11	18.3 ± 1.9	0.7 ± 0.3	15.8 ± 1.7
WPSL-31A	17.7 ± 2.4	0.9 ± 0.5	17.0 ± 2.4
WPSL-61	24.1 ± 1.7	1.1 ± 0.2	23.8 ± 1.7
001CHF	0.5 ± 0.1	0.0 ± 0.0	0.6 ± 0.1
005CHF	0.7 ± 0.2	0.02 ± 0.04	0.6 ± 0.1

<sup>a</sup>Uncertainties represent the 95% confidence level, based only on counting statistics.

**TABLE 4**  
**URANIUM GAMMA SPECTROSCOPY RESULTS**

SAMPLE ID	Radionuclide Concentration (pCi/g)					
	U-238 <sup>b</sup>	U-238 <sup>c</sup>	U-235 <sup>d</sup>	U-235 <sup>e</sup>	Pa-231 <sup>f</sup>	Ra-226 <sup>g</sup>
EPSL-06	49.2 ± 18.6 <sup>a</sup>	<228	53.7 ± 6.6 <sup>h</sup>	14.5 ± 1.8	51.7 ± 27.3	151.8 ± 5.8
EPSL-10	241.9 ± 26.7	423.6 ± 257.9	20.7 ± 6.5	37.4 ± 2.3	<54.2	283.8 ± 7.1
EPSL-11	34.1 ± 12.0	<41	30.5 ± 3.1	2.3 ± 0.6	96.4 ± 4.1	40.7 ± 1.4
WPSL-31A	<13.3	<45	62.2 ± 3.4	6.1 ± 0.6	77.4 ± 3.7	81.1 ± 1.7
WPSL-61	33.3 ± 11.7	39.3 ± 18.6	23.0 ± 3.1	1.7 ± 0.5	62.1 ± 3.4	23.5 ± 1.2
001CHF	<1.4	12.9 ± 11.1	<0.4	NR	<0.5	0.4 ± 0.3
005CHF	0.9 ± 0.9	<11	<0.4	NR	<0.4	0.5 ± 0.2

<sup>a</sup>Uncertainties represent the 95% confidence level, based only on counting statistics.

<sup>b</sup>U-238 is identified by a gamma line at 63 keV from its daughter, TH-234.

<sup>c</sup>U-238 is identified by a gamma line at 1001 keV from its daughter, Pa-234m.

<sup>d</sup>U-235 is identified by a gamma line at 143 keV.

<sup>e</sup>U-235 is identified by a gamma line at 186 keV.

<sup>f</sup>Pa-231 is identified by a gamma line at 302 keV.

<sup>g</sup>Ra-226 is identified by a gamma line 352 keV from its daughter, Pb-214.

<sup>h</sup>The 143 keV gamma line of U-235 is interfered with by the gamma emitted by Ra-223 which is a daughter of Pa-231.