INL/MIS-20-59301-Revision-0

EBR-II Driver Fuel Cladding Hull Analytical Data

Michael J Connolly, Michael N Patterson

August 2020

The INL is a U.S. Department of Energy National Laboratory
operated by Battelle Energy Alliance

INL/MIS-20-59301-Revision-0

EBR-II Driver Fuel Cladding Hull Analytical Data

Michael J Connolly, Michael N Patterson

August 2020

Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

Prepared for the
U.S. Department of Energy

Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517

EBR-II Driver Fuel Washed Cladding Hull Analytical Data

INL/MIS-20-59301-Rev00

Analytical Laboratory

Final Report

AL Log #: 86384 **SPM #: 223-080-60987-61695** 06-May-05 08:44

Login Name: FCF-ER DRIVER CLADDING HULLS - BATCH # ERBF011 **COC #:**

Requester: S. X.. Li D. Vaden **Charge #:**

Facility: FCF-ER **Date_Received:** 02-Sep-04 13:28

Approved by _____ **Date:** _____

Total Samples in Report: 2

Sample ID: **SADG10**

Where Taken: FCF-ER **Sampling Date:** 12-Aug-04 15:00

Description: **DRIVER CLAD HULLS - ACID WASH**

Analytical Method	Analyte	Result	Units	Error @ 2 Sigma
GAMMA SPEC	Ce-144	ND	N/A	N/A
	Co-60 0.0207 mCi/gram ±19% Cs-134 0.032 mCi/gram ±16% Cs-137 9.4 mCi/gram ±15% Eu-154 0.0194 mCi/gram ±25% Eu-155 0.075 mCi/gram ±18% Mn-54 0.00312 mCi/gram ±52% Ru/Rh-106 0.353 mCi/gram ±18%			
	Sb-125	1.35	mCi/gram	±15%

Comments:

Analytical Method	Analyte	Result	Units	Error @ 2 Sigma
ICP MS	Np-237 15.8 ug/g ± 5% Pu-239 323 ug/g ± 5% Pu-240 3.79 ug/g ± 5% Total Pu 326.8 ug/g ±5%			

Comments:

ICP OES

Ce	470 ug/g ±5% Cr	1.4 w/o ±5% Fe	5.15 w/o ±5% K	1.06 w/o ±5%
La		140	ug/g	±10%
Li		0.28	w/o	±5%
Mn	0.13 w/o ±5% Mo	0.85 w/o ±5% Nd	620 ug/g ±5% Ni	1.06 w/o ±5%
Ru	0.36 w/o ±5% Sm	180 ug/g ±5% Tc	0.17 w/o ±5%	
Zr		1.89	w/o	±10%

Comments:

MASS SPEC

Total U	7.004	mg/g	±0.5%
U-234	0.675	w/o	±2%
U-235	63.54	w/o	0.5%
U-236	1.439	w/o	±1%
U-238	34.35	w/o	±0.5%

Comments:

Physical Measurements

Dissolver Wt.	119.7509	g	±0.0003
Empty hull WT.	2.8870	g	±0.0003
Number Of Hulls	10	n/a	n/a
Spl. Wt. Recvd	5.0213	g	±0.0003

Comments:

Sample ID: **SADG10**

Where Taken: FCF-ER

Sampling Date: 02-Sep-04 13:29

Description: **DRIVER CLAD HULLS - WATER WASH**

****

Analytical Method	Analyte	Result	Units	Error @ 2 Sigma

****

GAMMA SPEC

Ce-144	ND	N/A	N/A
Co-60	ND	N/A	N/A
Cs-134	0.129	mCi/gram	±16%

Cs-137	38.1	mCi/gram	±15%
Eu-154 0.07 mCi/gram ±54% Eu-155 0.232 mCi/gram ±17%			
Mn-54	ND	N/A	N/A
Ru/Rh-106	ND	N/A	N/A
Sb-125	ND	N/A	N/A

Comments:

ICP MS

Np-237 55.6 ug/g ± 5% Pu-239 1245 ug/g ± 5% Pu-240 16.0 ug/g ± 5% Total Pu 1261 ug/g ±5%

Comments:

ICP OES

Cd 130 ug/g ±5% Cr 40 ug/g ±5% Fe 740 ug/g ±5% K 5.03 w/o ±5% Li 1.3 w/o ±5%

Ni	80	ug/g	±5%
Zr	0.31	w/o	±5%

Comments:

MASS SPEC

Total U	8.744	mg/g	±0.5%
U-234	0.666	w/o	±2%
U-235	63.24	w/o	±0.5%
U-236	1.364	w/o	±1%
U-238	34.73	w/o	±0.5%

Comments:

Physical Measurements

Dissolver Wt.	61.7348	g	±0.0003
Empty hull WT.	2.8870	g	±0.0003
Number Of Hulls	10	n/a	n/a
Spl. Wt. Recvd	5.0213	g	±0.0003

Comments:

INL - Materials and Fuels Complex

Analytical Laboratory

Final Report

Fin Repo

AL Log 101235 SPM # Nal rt

Login Name: FISSIUM DRIVER CLAD HULLS ERFS013.05 COC NA

Requester: M. PATTERSON, G. GALBRETH, E. FLYNN, B. WETAPHAL, Charge#: 101730740
D. VADEN, J. RODRIGUEZ

Facility: -, Bldg. 765 FCF, Bl . 765Date Received:
23-Aug- 1711:11:0

Approved by Date: 5/17/18

Total Samples in Report: 2

Sample ID: SADR59

Where Taken: FCF Sampling Date: 6/1/2017

Description: ACID WASH
FISSIUM DRIVER CLAD HULLS ERFS013.05 BASKET #1

Analytical Method	Analyte	Result	Units	Error @ 2 Sigma
Gamma Spec				
	CelPr-144		uCi/grams	N/A
		<6e+O	uCi/grams	N/A
	cs-134	<5e+O	Ci	
	cs-137 1.31 uCi/grams ±3%	Eu-154 1.40e+1 uCi/grams ±3%		
	Eu-155	<3e+l	uCi(grams	
	Mn-54	<5e+O	uCi/grams	N/A
	Ru/Rh-106 uCi/grams N/A	Sb-125 uCi/grams		

Comments:

ICP MS

23413 5_aa ug/g ±5% 2350 65100 uglg ±5%

INL - Materials and Fuels Complex

Analytical Laboratory

236U	1750	ug/g	±5%
237Np		uglg	
238U	35000	uglg	
239Pu	1180	uglg	±5%
240Pu 27.4 ug/ g U Total	102000 uglg		

Comments:

AL Log #:

Continued

ICP OES

Fe	<120		N/A
K	698		ug/g±
La		ug/g	
Li	18400	ug/g	uglg
Mn	68500	ug/g	± 5%
Mo	11300	ug/g	ug/g ± 5%
<410 N/A		ug/g	± 5%
1770± 10%		ug/g	
Ni	1690		
Pd	46600		
Rh	2130		
Ru	979± 20%		
	14500	gl g	
	4970	uglg	± 20%
	3670		
	14100	ug/g	
Sm	ugLg		NIA
Tc 2410	ugl_g 336	ug/g	
Y	13400		uglg
Zr			

10%

Comments:

Phvsical Measurements

Dissolver Wt.	122.4560	±0.0010

Comments: Weight of sample received used to calculate final values for all analyses

INL - Materials and Fuels Complex

Analytical Laboratory

Sample ID: SADR59

Where Taken: FCF Sampling Date: 6/1/2017

Description: WATER WASH
FISSIUM DRIVER CLAD HULLS ERFS013.05 BASKET #1

Analytical Method	Analyte	Result	Units	Error @ 2 Sigma
Gamma Spec				
	Ce(Pr-144	<2e+2	uCi/grams	N/A
	co-60	<4e+O	uCi/grams	N/A
	cs-134	<5e+O	uCi/grams	N/A
	cs-137	6.39e+4	uCi/grams	

AL Log #: Continued

Eu-154	7.68e+1	uCi/grams	
Eu-155	8.3e+1	i ram	±23%
Mn-54	<4e+0	uCi/grams	NIA
Ru/Rh-106	<2e+2	uCi/grams	NIA
Sb-125		uCi/grams	N/A

Comments:

ICP MS

2340	19.8	ug/g	±5%
235U	2050	ug/g	±5%
23613	58.9	ug/g	±5%
237Np	67.4	uq/q	±5%
238U 1110 ug/g ±5% 239Pu	4650 uglg ±5% 240Pu 129 ug/g ±5%		
99Tc	N/A	N/A	N/A
U Total	3240	ugLg	

Comments:

ICP OES

Cd		uglg	N/A

INL - Materials and Fuels Complex

Analytical Laboratory

K		2220	ug/g	± 5%	
La		<95	ug/g	± 5%	
Li	1170	uq/q 37100	uglg	± 5%	
		1180			
		12000	uglg	± 5%	
Mn			ug[g	± 5%	
Ni			ug/g	N/A	N/A
Pd		8840	uglg		
Rh		3680	ug/g	N/A	
Ru			uglg	N/A	
		<230 ug/g N/A	<370 uglg	± 5%	
			uglg	N/A	
Sm		891		± 5%	
		<110	uglg	± 5%	
		556			
Zr			uglg		

AL Log #: Continued

Comments:

Phvsical Measurements

Dissolver Wt.	65.0896		±0.0010
Empty Hull Weig	0.6898		±0.0010
Number of Hulls	5	n/a	nl_a
Spl. Wt. Recved	2.2310		

Comments: Weight of sample received used to calculate final values for all analyses