

# Acrylic Radioactivity Mass Spectroscopy results at CRNL since the LANL collaboration meeting.

## CYRO:

Some errors in numbers

Ten Cyro samples from the same sheet of acrylic were vaporized in three suprasil tubes and the residue analysed for Th and U at CRNL. The tubes containing the residue were washed out with a HCl/HNO<sub>3</sub>/HF mixture. The backgrounds were from HNO<sub>3</sub>/HF rinses done after the residue rinse. This procedure was found to be most effective in earlier runs in Dec-89.

The results listed below indicate that at least 90% of the Th and U is removed in the first rinse, that there is still a U contamination problem with the CRNL mass spect. procedure, that the Th content of this Cyro material is too high for SNO and that the concentrations of Th routinely vary by a factor of 2 (from 6 to 17 ppt) with one sample in the set of ten about 10 times higher.

		CYRO		
		Th (ng)	U (ng)	Th/U (ppt)
Jan 10	Tube 6 bdg	2.5	1.7	
	0.685 kg C1K	7.1	6.2	10/9
	Bdg	0.40	1.6	
Jan 15	Bdg	0.02	2.6	
	0.682 kg C1N	5.0	4.3	7/6
	Bdg	0.30	2.3	
Jan 19	Bdg	0.14	1.2	
	0.685 kg C1Q	6.8	3.1	10/5
	Bdg	0.72	0.72	
Jan 25	Bdg	1.3	0.48	
	0.641 kg C1T	9.0	3.2	14/5
	bdg	0.68	0.43	
Jan 10	<u>Tube 7 bdg</u>	0.08	0.84	
	0.682 kg C1L	9.7	2.6	14/4
	Bdg	0.46	1.2	
Jan 16	Bdg	0.23	3.2	
	0.666 kg C1P	4.0	4.2	6/6
	Bdg	0.13	2.2	
Jan 25	Bdg	0.15	0.24	
	0.666 kg C1S	10.5	3.1	16/5
	bdg	0.24	0.22	

0.3ng Bdg. U. These samples from first

Jan 12	Bdg Tube 8	0.07	0.62	
	0.679 kg C1M	43.4	6.6	64/10
	Bdg	1.1	1.0	
Jan 16	Bdg	0.39	2.3	
	0.675 kg C1O	4.3	4.2	6/6
	bdg	0.86	2.3	
Jan 24	bdg	0.14	0.18	
	0.645 kg C1R	10.9	2.5	17/4
	bdg	0.75	0.33	

## Polycast Material:

Six samples of Polycast acrylic taken from material recently received from Polycast have been vaporized and checked by TIMS. Polycast shipped us seven pieces and two of these pieces (B1 & B2) were cut into three lots, or panels, each (SB is the central panel, SA & SC the outside panels) and measured. The Th in the 2nd rinse was added to the acrylic rinse to get the Th ppt concentration whereas 0.3 ng U bdg was subtracted from the U acrylic rinse numbers. The piece with 11.9 ppt Th can from the first panel vaporized and in this case, only, the ID markings on the edge of the panel was not complete washed off before the vaporization. Still I would be surprised if that explained the relatively high value. So as in the case of the 10 Cyro runs above there seems to be one high value out of this set.

		Th (ng)	U (ng)	Th/U (ppt)
Mar 7	Bdg (tube 10)	0.19	0.37	
	1.16 kg P9-B1-SA	13.3	5.6	11.9/4.5
	Bdg	0.56	0.40	
	Bdg	0.22	0.46	
Mar 8	Bdg (tube 11)	0.19	0.44	
	1.21 P9-B1-SB	3.7	2.2	3.5/1.7
	Bdg	0.55	0.23	
	Bdg	0.09	0.28	
Mar 9	Bdg (tube 10)	0.1	0.28	
	1.17 kg P9-B1-SC	5.7	3.6	5.3/2.8
	Bdg	0.45	0.18	
	Bdg	0.05	0.30	

Mar 12	Bdg (tube 11)	0.20	0.36	
	1.18 kg P9-B2-SA	6.2	3.4	5.8/2.6
	Bdg	0.59	0.33	
	Bdg	0.08	0.31	
Mar 13	Bdg (tube 10)	0.15	0.33	
	1.2 kg P9-B2-SB	5.6	1.7	4.9/1.2
	Bdg	0.31	0.35	
	Bdg	0.08	0.45	
Mar 14	Bdg (tube 11)	0.07	0.31	
	1.3 kg P9-B2-SC	4.7	2.5	3.8/1.7
	Bdg	0.20	0.22	
	Bdg	0.07	0.32	
Feb 28	new HF/HNO3	0.14	0.31	
Feb 22	Beaker BDG	0.02	0.06	
Mar 30	20 ml HF/HNO3	0.03	0.34	

## DDD Water:

DDD water from the 115 still had not more than 0.1 ppt Th which is inconsistent with the neutron activation results on the same water (> 3 ppt). ????

A second DDD sample was irradiated but upon opening the container the water was absent. The container leaked. Two of three other containers with DDD water also leaked. These containers had been modified to prevent leaking.

		Th (ng)	U (ng)	Th/U (ppt)
Jan 16	16 ml Aqua	0.07	2.2	Th/U
Jan 15	Beaker (acid)	0.22	2.2	
Jan 30	Beaker bdg (acid)	0.21	2.1	
	500 ml DDD in beaker	0.05	2.0	0.1/4
	Beaker bdg (acid)	0.29	2.2	

## Alpha Counting:

A quantity of stores acrylic was vaporized for alpha counting. This sample was also checked with TIMS. The two results were consistent. Th/U concentrations 2.5/0.86 ppt for the TIMS and 2.8/1 ppt for the alpha counting.

In addition, 1.27 kg was vaporized slowly at 325 C instead of 550 C these took 24 hours whereas at 550 C it would have taken only 3 hours.

		Th (ng)	U (ng)	Th/U (ppt)
Feb 23	6% of 15.54 kg	2.2	0.76	2.5/0.86
Tube 2	Bdg	3.7	1.2	
	Bdg	2.1	0.6	
Stores	94% of 15.54 kg alpha counting			2.8/1
Mar 23	Bdg (tube 7)	0.14	0.26	
Slow burn	1.27 kg Stores	10.3	2.9	8.4/2.0
	Bdg	0.39	0.43	
Late Mar	T-6 Tube bdg	0.21	0.17	
Late Mar	T-8 Tube bdg	0.07	0.14	

## RNAA & TIMS comparison:

Irradiated samples gamma counted at CRNL and at Queen's were vaporized and measured by TIMS.

		Th (ng)	U (ng)	Th/U (ppt)
Feb 20	Bdg(acid)	0.07	5.7?	
T-7	Bdg	0.06	0.6	
	Acrylic irradi. #1	0.48	1.3	
	Bdg	0.29	0.37	
	Bdg	0.51	0.36	
Mar 9	Bdg	0.07	0.49	
	Acrylic irradi. #2	0.91	0.75	
	Bdg	0.07	0.24	
	Bdg	0.07	0.42	

Total Th in acrylic from TIMS 2.2 ng. cf Edwards claims from Pa 233 counting  
8.9+-1.6 ng or 237 ppt.

## Slow burn on Cyro material.

Since the difference between the RNAA and TIMS on the same material suggested that we might have lost some Th in the vaporization we did several slow vaporization on two cyro samples. These were from the same sheet as the earlier set of 10 runs where the results were 6-17 ppt Th except for one at 64 ppt. The slow burn takes 4 hours for 200 g at 325 C as compared to the fast burn of 0.5 hours for 200 gms at 550 C. The results are consistent with the 10 fast burn results. There was an additional slow burn of stores acrylic which came in at three times the fast burn work. The U does not seem to vary as much. More work is required to check this slow vs fast burn So it would seem the the jury is still out on whether or not we are losing Th during the burn phase.

			Th (ng)	U (ng)	Th/U (ppt)
Apr 6	CIU Bdg		0.07	0.22	
T-6	0.863 kg Cyro		4.1	4.7	5.1/5.4
	Bdg		0.34	0.19	
	Bdg		0.08	0.21	
Apr 11	CIV Bdg		0.57	0.22	
T-6	0.875 kg Cyro		32.3	2.1	38.5/2.4
	Bdg		1.4	0.14	
	Bdg		0.24	0.27	

## Work in Progress:

Several liters of Polycast monomer with inhibitor from various collection points along their production line have been shipped to CRNL for mass spec. In addition, several samples of just monomer have arrived and one of them has been irradiated but there is no result yet. Bottles have been sent to Swedlow for monomer.

A sheet of Rohm material has arrived at CRNL. Ten kgs or 1/3 has been cut up for mass spect. and neutron activation. We will do 6 or so samples with fast and slow burns.

Cyro & Polycast acrylic sent to Jagam and several pieces of Polycast sent to LANL.

A quantity of Cyro acrylic has been laser cut at NRC for RNAA.

A piece of Swedlow whitened is on hand for RNAA. This has Pb in it and is 0.05% of acrylic.