LANL Acrylic Report (J Wilhelmy, M Fowler) SNO-STR-90-148

Abstract:

Samples of acrylic spiked with Th have been made for distribution to the collaboration for checks on their measuing techniques. The uniformity of the spike and the measuring techniques at LANL have been verified.

Text:

We (Jerry at LANL) have assayed by NAA Th spiked acrylic made at LANL by Mac. We took four different samples from the first rod Mac cast. Each sample was about 3.5 gm. The total rod weighed 303.55 gm and Mac added 40.6 micrograms of 232Th. (i.e. 134 ng/gm). After irradiating for one hour we counted the 233Pa to determine the 232Th concentration. We used our well counter and counted each sample in one direction and then rotated it 180 degrees and counted it the other way (this checks for nonuniformity of the Th distributions - with previous commercial sources of acrylic we would often see detection rates vary by a substantial amount when this rotation was performed - thus indicating non homogenaities in the sample). The results were:

sample	irrad port	orient. 1	orient. 2
3010	R-4	133 +/- 1.20	136 +/- 1.18
3020	R-4	134 1.18	135 1.19
3030	R-5	127 1.14	127 1.14
3040	R-4	136 1.18	136 1.20

As you can see all of the samples gave good agreement with the additive amount and showed no significant inhomogenaities. The sample 3030 was irradiated in a different port than the other three and gave a somewhat low value. We did not have a specific flux monitor in the irradiation. With previous flux tests we had reproduced the reactors claimed fluence (9.7e12 n/cm2-sec) in both ports and therefore do not regularily check the value. The reactor had been shut down for a long maintainence perior and we have not used it recently. However, one of my colleagues claims that his samples done in the R-5 port were consistenly giving a 5% lower value than the other port. If we would scale the 3030 sample up by this 5% factor then it would be in excellent agreement with the others. The bottom line is that we are quite confident we have a very well calibrated sample containing 134 ng/gm of 232Th.

One of these irradiated samples has been shipped to CRL where it will be counted with their well shaped Ge detector. Mac has made another acrylic rod spiked with Th and that also has been shipped to CRL together with a small portion of the first rod, a portion that had not been irradiated. CRL plans to count the small irradiated piece immediately upon arrival and do NAA and vaporization (followed by TIMS and alpha counting) on the unirradiated samples. Samples should also be sent to Guelph.

One other item of information. We took one of our irradiated samples

(#3010) and added some 231Pa tracer (as we have done in all of our previous measurements of commercial acrylic) and then volatilized the mixture using our standard technique. We did this as a method of certifying that the spike behaved in the same manner as the bulk acrylic. The results were:

233Pa from acrylic = 86.0 +/- 0.6% recovery
231Pa from spike = 84.1 +/- 1.8% recovery

This is very gratifying in that it shows (as we have always assumed) that the tracer behaves the same as the bulk material.