

# MUSEUM OF FINE ARTS

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September 21, 1978

3705

Research Laboratory

Mr. Frederick Combs  
Radioisotope Licensing Branch  
Division of Fuel Cycle and  
Material Safety  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Mr. Combs:

Referring to your letter of May 25, 1978 (Control No. 94076, renewal of license no. 20-13135-02), let me answer your questions in the order in which you stated them.

- 1) a.  $^{90}\text{Sr}$  -  $^{90}\text{Y}$  source, obtained from Radiochemical Centre, model No. SIP-13. Rated 40mCi in 1973.
  - b.  $^{242}\text{Cm}$  source, obtained from Radiochemical Centre. This contained source was especially prepared by Amersham for application in thermoluminescence dating. The curium is electrodeposited and the active surface covered with a micromil window. This source was rated 5mCi in 1973, and has therefore decayed to ca. 0.5% of its original activity.
  - c.  $^{242}\text{Cm}$  source, 2mCi: this source has not been purchased as yet. Instead we would like to obtain a  $^{244}\text{Cm}$  source, model no. AF-244 from Isotope Products, of the same strength. This model source is covered with a 1.2 mg/cm<sup>2</sup> titanium window protected by a stainless steel mesh.
  - d.  $^{241}\text{Am}$  source, obtained from Radiochemical Centre, model no. AHR-3. Rated 0.1mCi in 1973.
  - e.  $^{14}\text{C}$  source, extended source, particles dispersed in a plexiglass sheet. Rated 10mCi.
- 2) Survey meter: model E-120 from Eberline Instr. Co., with an HP-190 probe.  
Range of sensitivity: 0-50 mR/h.  
Calibrated twice annually by Mr. Murray Bolton at Massachusetts Institute of Technology. Calibration procedure: 2 points on each scale, using NBS certified standards.
  - 3) Enclosed with this letter you will find a floorplan of our laboratories. At the end of the corridor a special laboratory for thermoluminescence dating contains the equipment used in this technique. Within this

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laboratory the  $^{90}\text{Sr}$ - $^{90}\text{Y}$  and  $^{241}\text{Am}$  sources are used and housed. When not used, the  $^{90}\text{Sr}$ - $^{90}\text{Y}$  source is stored in a lead pig within a lead box, when preparations are made for an experiment the lead pig with the source in it is removed from the lead box and placed close to the location where irradiations take place. The  $^{241}\text{Am}$  source is stored in a steel case.

The laboratory is always locked and can only be entered by authorized personnel with the appropriate key.

The alpha source used for sample irradiation (curium source) is housed within a desiccator in the fume hood of the chemistry laboratory, when it is used the operation takes place within the fume hood. As for all laboratories on this floor, only authorized personnel with the proper key have access.

In the X-ray room, of which the walls are all lead-lined because of the use of this room for X-ray radiography and X-ray fluorescence spectrophotometry, a locked metal box containing the  $^{14}\text{C}$  plexiglass source is stored in a cabinet. This room, besides the limited access by proper key, also is provided with a night alarm.

The locations of the various sources have been marked on the enclosed floorplan.

- 4) See enclosed copies of instructions.
- 5)
  - a. Wipe tests of work areas and floors of laboratories in which sources are used, performed monthly. Tested with the aid of the Eberline E120 survey meter equipped with HP 190 probe.
  - b. Three monthly wipe test inspections of sources, performed by Mr. Murray Bolton (referred to earlier under point 2).
  - c. Personnel monitoring by means of film badge dosimeters, changed and read monthly by R.S. Landauer Jr. & Co., Glenwood, Ill.
- 6) Enclosed you will find the fire escape plan. The local fire department has been notified that radioactive material is contained in these areas. Because the sources are sealed the potential of harm coming to anyone is minimal.
- 7) Wipe tests are performed every three months by Mr. Murray Bolton. The dry wipe method is used, the wipes are counted with an instrument capable of detecting less than 0.0005 Ci. The instrument is calibrated with NBS certified sources.

Mr. Frederick Combs  
August 25, 1978  
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- 8) The sources will be returned to the manufacturers or disposed of through a licensed waste disposal agency (Interex Corporation, Natick, MA).

I hope that this information will enable you to proceed with the procedure for renewal of our license.

Sincerely,

A handwritten signature in dark ink, appearing to be 'L. van Zelst', with a circular flourish at the beginning and a long horizontal stroke extending to the right.

L. van Zelst  
Director of Research

LvZ:ljf

enclosure

## INSTRUCTIONS TL DATING

### Irradiations with known doses

#### I. General

- 1) Whenever performing TL experiments, which most often will involve irradiations, wear the personal film badge dosimeter at all times.
- 2) When sources are used, the radiation levels around the work area should be checked with the Eberline counter.
- 3) In case of unusual events of emergency, immediately notify the department head and/or the radiation safety officer.
- 4) After use, place sources back into their proper storage housings. Close and lock laboratories upon leaving.
- 5) When in doubt, ask!!

#### II. Beta irradiation

##### 1) General remarks:

The <sup>90</sup>Sr source is housed in a cylindrical lead pig which itself is stored within the lead box on the counter left of the equipment table. When the equipment is shut off after experiments have been finished, the source in its pig should be placed back into this house. During experimental runs the pig can be placed on the counter behind the lead bricks.

The source itself is mounted in a cylindrical house, with the window at the underside and with a ca. 3 inches handling rod on the back of the house. When handling the source, hold it always at the tip of this rod. Never point the source towards you. Handle the source as short as possible. Remember that this source does not only emit beta radiation, but also generates bremsstrahlen.

##### 2) Sample irradiation:

- a) Lift photomultiplier off glow oven, replace on parking plate.
- b) Lift glow shield off heating strip, replace with spacer. Note that this fits only one way; the seat at the top will accomodate the source.
- c) Place cylindrical lead-perspex shield on the glow oven.
- d) Reset stop watch. Lift cover off lead pig.
- e) Holding the source by the end of the handling rod, transport it quickly out of the pig inside the shield onto the seat on the spacer. Start stopwatch.
- f) Leave source for the time required to accumulate the desired dose. (Dose rate using the spacer is 109 R/min at the sample location as per 1/1/78).

- g) At the end of the irradiation time, pick source up at the end of the rod and swiftly transfer into the pig. Close the pig.
- H) Remove lead-perspex shield, remove spacer and replace with glowshield.
- i) Place P.M. tube on top of glow oven. Proceed as under instructions for the glow run.

### III. Alpha Irradiation

#### 1) General remarks:

Always wear rubber or vinyl gloves when handling the source. The alpha source is housed in the marked desiccator in the fume hood of the chemistry lab. It is seated in a cylindrical aluminum holder, above a filter paper disc. This paper should be checked with Eberline counter for source leakage, and replaced with a new, dated filter paper circle every day the source is used. Old filter papers are deposited in the marked beaker and will be removed by the radiation safety consultant on his inspections.

The source is mounted in a brass house with a window at the underside and a handling extension on the back. Always hold the source by the handle.

For irradiations of sample planchets the latter are placed in the provided space in the perspex-aluminum irradiation cylinder. Then the source is placed in its seat in this holder. The distance of source window- sample surface is so small that vacuum is not necessary, indeed the source is calibrated for irradiation under these conditions through air.

All handling of the source has to be done in the fume hood!

#### 2) Sample irradiation.

- a) Place the planchet in the milled out position at the bottom of the aluminum-perspex irradiation cylinder.
- b) Reset stopwatch.
- c) Open desiccator. Lift source by the handle and put it quickly on its seat in the irradiation cylinder. Start stopwatch.
- d) Irradiate for time required for desired dose to accumulate. For the dose rate refer to the calibration curve.
- e) Lift source off its seat and place it back into its parking cylinder in the desiccator. Close desiccator.
- f) Remove planchet from its seat and transfer to TL lab onto glow strip.

Continue as for glow runs.

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LIBRARY	N. ALLEN	W. Greenhouse	X 233
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1. WHEN BUILDING EVACUATION ALARM SOUNDS, WARDENS ARE TO MAKE SURE THEIR AREA IS CLEAR OF ALL PERSONNEL, THEN CALL THEIR ABOVE LISTED EXTENSION AND REPORT "ALL CLEAR".
2. WARDENS ARE TO REMAIN ON THEIR FLOORS TO MAINTAIN SECURITY. IN THE CASE OF AN ACTUAL FIRE, WARDENS WILL BE RELIEVED BY BUILDING AND GROUNDS PERSONNEL.
3. WHEN ALL FLOORS HAVE REPORTED IN, THE "ALL CLEAR" SIGNAL WILL BE SOUNDED. ALL PERSONNEL WILL THEN RETURN TO THE BUILDING.

EVACUATION DRILLS

<u>DATE</u>	<u>ELAPSE TIME</u>
June 27, 1974	2 min.
Sept. 24, 1974	1 min. 45 sec.
July 21, 1975	1 min. 30 sec.
July 28, 1976 (no alert)	2 min. 15 sec.
Mar. 16, 1977 (bomb scare)	3 min. 20 sec.
June 17, 1977	2 min. 10 sec.

DIRECTIONS FOR EVACUATING THE BUILDING ARE POSTED ON ALL FLOORS.



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## SOURCES

### MANUFACTURER & DISTRIBUTOR:

Amersham/Searle  
Arlington Heights, Illinois

### ISOTOPE:

Strontium 90

### MODEL DESIGNATIONS:

SIA 1-6 (ophthalmic,  
1-17mc)

SIP 1-17 (plaques,  
5-50mc)

SIQ 1-21 (plates, 5-50mc)

### USE:

Clinical beta sources

### DESCRIPTION:

The active foil is constructed by forming the Strontium 90 titanate into a cermet, fitting it into a silver case and welding the package together by application of heat and pressure and then rolling it into a thin "intermediate" foil. A properly shaped foil is cut out of this and the process is repeated. The "final" foil has a 1mm total thickness and at 0.1mm "front face" of silver shielding. For the models SIA 1-6, the "final" foil is formed into a correctly curved silver or plastic applicator onto which a handle is soft-soldered. The models SIP 1-17 flat foils, after manufacture, are put into a protective aluminum alloy case onto which a handle can be screwed. The models SIQ 1-21 flat foils, after manufacture, have a silver boss soft-soldered to the back of each onto which a handle can be screwed. The detachable handles are approximately 10cm long.

The "final" foil is protected against corrosion by a rolled gold coating. The thickness of the silver shield at the back of each applicator is approximately 0.8mm which is sufficient to stop all 2.27 Mev beta rays from yttrium 90. There is no beta dose at the back or edges of each applicator but there is a bremsstrahlung dose of 100mR/hr at 1cm for each 1mc of strontium 90.

### OPTIONAL EQUIPMENT:

A plastic beta shield (6mm thick) and handling gun is offered as an optional extra for use with the models SIA 1-4 applicators. Beta shields are not normally used with the other applicators. A lead storage container of screw lid construction is available into which models SIA 1-4 fit. The container is 60mm in diameter by 65mm high and 6mm thick.

U. S. ATOMIC ENERGY COMMISSION

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