

## MALLINCKRODT CHEMICAL WORKS

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SECOND AND  
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25 February 1958

*Mallinckrodt*  
FINE CHEMICALS  
Standard Since 1867

Mr. Lyall Johnson  
Licensing Division  
U.S. Atomic Energy Commission  
Washington, D. C.

SUBJECT: Special Nuclear Materials License No. SNM-33

Dear Mr. Johnson:

This communication is a request for expansion of our Special Nuclear Materials License No. SNM-33 to include the preparation of  $UO_2F_2$  and  $UO_2(NO_3)_2$ .

The equipment to be used is described fully in our letter of 21 January 1957. The equipment so described has been used repeatedly for the preparation of enriched uranyl sulfate. The procedure proposed for the preparation of  $UO_2F_2$  will be essentially as follows:

1. Enriched  $UF_6$  will be processed in our approved facility to prepare "limited safe" batches of  $UO_3$ .
2. The  $UO_3$  will be dissolved in high purity aqueous HF to prepare a solution of  $UO_2F_2$ .
3. The solution will be concentrated, filtered, and packaged in polyethylene bottles of safe geometry for shipment in approved birdcages. (It is anticipated that because of the well-known dusting problem encountered when attempting to make a solution of solid  $UO_2F_2$ , that most requests for this material will be as a concentrated solution. The concentration of the solution to be shipped will, in no case, exceed 3 g  $UO_2F_2$ /cc so that the 5" diameter shipping container will insure nuclear safety.)

For the preparation of uranyl nitrate, the following procedure will be utilized:

1. Enriched  $UF_6$  will be processed in "limited safe" batches in our approved facility for the preparation of high purity uranium oxide.
2. The "limited safe" batches of oxide will be transferred to the soluble products hood and dissolved in high purity nitric acid.

70  
B-6

Mr. Lyali Johnson  
Page Two  
25 February 1958

3. The nitrate solution will be filtered and packaged in polyethylene bottles or, in the case where crystalline material is requested, will be evaporated to approximately the hexahydrate composition, allowed to cool and crystallize.

The above described procedures have been thoroughly tested in this equipment using natural assay uranium. It has been determined that the equipment, hood, and procedures described are quite adequate and produce products of acceptable purity with excellent recoveries. All of the equipment for the preparation of these soluble salts is located in an especially constructed hood. All dry operations are carried out in glove boxes. The exhaust air from the glove boxes passes through MSA filters before discharge to the atmosphere.

In all cases, the salts or solutions prepared as described above will be shipped in polyethylene bottles which will be further enclosed in safe geometry stainless steel outer containers. Tests have demonstrated that the rate of corrosion of stainless steel in contact with these neutral salts is exceedingly low. We submit, therefore, that this double packaging technique, with a gasketed outer metal container, enclosed in an approved birdcage should provide complete nuclear safety during shipment.

We are specifically requesting approval of the procedures outlined above for the preparation of solutions and solid  $UO_2F_2$  and  $UO_2(NO_3)_2$  and, in addition, expansion of our sulfate preparation technique to permit us to prepare and ship solutions of neutral uranium sulfate. We are further requesting approval of the shipping procedures described above. In all cases, the "limited safe" batch will be utilized for the preparation of these salts, depending upon assay. It is requested that these procedures be approved for any assay of uranium.

If you desire additional information, we should be happy to comply with your request.

Sincerely yours,

MALLINCKRODT CHEMICAL WORKS

W. M. Leaders  
Technical Director  
Special Metals Division

WML:dj

City of St. Louis)SS  
State of Missouri)

Subscribed and sworn to before me this                      day of                      1958

Notary Public