40-2810

FORM AEC-2
(2-61)
Previous editions are obsolete.

FORM APPROVED
BUREAU OF BUDGET NO. 38-R002.8.

UNITED STATES ATOMIC ENERGY COMMISSION

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APPLICATION FOR SOURCE MATERIAL LICENSE

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, source material for the activity or activities described.

1. (Check one)
- ☐ (a) New license
- ☐ (b) Amendment to License No. _____
- ☒ (c) Renewal of License No. SMB-334
- ☐ (d) Previous License No. _____

2. NAME OF APPLICANT
Research Division, W. R. Grace & Co.

3. PRINCIPAL BUSINESS ADDRESS
Washington Research Center, Clarksville, Maryland

4. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED
Washington Research Center, Clarksville, Maryland
Research Division, W. R. Grace & Co., Curtis Bay, Maryland

5. BUSINESS OR OCCUPATION
Chemical Research

6. (a) IF APPLICANT IS AN INDIVIDUAL, STATE CITIZENSHIP

(b) AGE

7. DESCRIBE PURPOSE FOR WHICH SOURCE MATERIAL WILL BE USED
Basic laboratory research at the Washington Research Center and development work at Curtis Bay for the development of nuclear fuel materials. No production is involved.

8. STATE THE TYPE OR TYPES, CHEMICAL FORM OR FORMS, AND QUANTITIES OF SOURCE MAT... POSSESS, USE, OR TRANSFER UNDER THE LICENSE ...L YOU PROPOSE TO RECEIVE.

(a) TYPE	(b) CHEMICAL FORM	(c) PHYSICAL FORM (*Including % U or Th.*)	(d) MAXIMUM AMOUNT AT ANY ONE TIME (*in pounds*)
NORMAL URANIUM			
URANIUM DEPLETED IN THE U-235 ISOTOPE	$UO_2Cl_2 \cdot 6H_2O$ oxides (hydrous)	Salts, solutions 5-53w/o Sols, ceramics 5-88w/o	1000 lbs.
THORIUM	$Th(NO_3)_4 \cdot 4H_2O$ oxides (hydrous)	Salts, solutions 5-42w/o Sols, ceramics 5-88w/o	600 lbs.

(e) MAXIMUM TOTAL QUANTITY OF SOURCE MATERIAL YOU WILL HAVE ON HAND AT ANY TIME (*in pounds*)
1600 lbs.

9. DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL, OR NUCLEAR PROCESS OR PROCESSES IN WHICH THE SOURCE MATERIAL WILL BE USED, INDICATING THE MAXIMUM AMOUNT OF SOURCE MATERIAL INVOLVED IN EACH PROCESS AT ANY ONE TIME, AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL HAZARDS ASSOCIATED WITH EACH STEP OF THOSE OPERATIONS.
Wet chemical operations are used avoiding dust hazards. The Research Center uses experimental quantities of 50-1000 g. Process studies are made with less than 30 lb. quantities. Activities at both sites are modest in extent and quantities. Systematic efforts control the main hazard of area and personnel contamination in compliance with our policy of high safety standards, AEC, and state regulations.

10. DESCRIBE THE MINIMUM TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE THAT WILL BE REQUIRED OF APPLICANT'S SUPERVISORY PERSONNEL INCLUDING PERSON RESPONSIBLE FOR RADIATION SAFETY PROGRAM (OR OF APPLICANT IF APPLICANT IS AN INDIVIDUAL).
Laboratory Supervision-experienced Ph.D; Process development-experienced engineer. Dr. J. D. Moyer, Radiation Protection Officer, has Ph.D in chemistry, courses in radiochemistry and radiological health, 14 years radioisotope experience, and 4 years R.P.O. at this installation.

11. DESCRIBE THE EQUIPMENT AND FACILITIES WHICH WILL BE USED TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY AND RELATE THE USE OF THE EQUIPMENT AND FACILITIES TO THE OPERATIONS LISTED IN ITEM 9: INCLUDE: (a) RADIATION DETECTION AND RELATED INSTRUMENTS (including film badges, dosimeters, counters, air-monitoring and other survey equipment as appropriate. The description of radiation detection instruments should include the type of radiation detected and the range(s) of each instrument.)

See supplemental sheet, Item 11a

(b) METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN (a) ABOVE (for film badges, specify method of [illegible] and processing, or name supplier.)

See supplemental Sheet, Item 11b

11(c). VENTILATION EQUIPMENT WHICH WILL BE USED IN OPERATIONS WHICH PRODUCE DUST, FUMES, MISTS, GASES, ETC.

Our solution chemistry and small scale sintering studies (no grinding) involve negligible dusting, misting, etc. - Operations are in well ventilated hoods. Contained working spaces with absoluted filters were developed for more toxic materials and are available for any operation involving the above hazards.

12. DESCRIBE PROPOSED PROCEDURES TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE AND PROPERTY AND RELATE THESE PROCEDURES TO THE OPERATIONS LISTED IN ITEM 9. INCLUDE:
(a) PROCEDURES FOR USE OF NUCLEAR MATERIALS AND SAFETY FEATURES AND PROCEDURES TO AVOID NONNUCLEAR ACCIDENTS, SUCH AS FIRE, EXPLOSION, ETC., IN SOURCE MATERIAL STORAGE AND PROCESSING AREAS.

The laboratories emphasize a basic safety and inspection program. Factors to note are (1) modern fire-proof construction (2) in-use lab. minimum of source materials and flammables (3) safe storage areas for source materials and flammables.

(b) EMERGENCY PROCEDURES IN THE EVENT OF ACCIDENTS WHICH MIGHT INVOLVE SOURCE MATERIAL.

See supplemental sheet, item 12b, which is copy of our emergency instructions.

(c) DETAILED DESCRIPTION OF RADIATION SURVEY PROGRAM AND PROCEDURES.

Our background of being trained and equipped for Toxic Materials (past applications -File 40-2810) is being maintained. See supplemental sheet, item 12c for Survey Program.

13. WASTE PRODUCTS: *If none will be generated, state "None" opposite (a), below. If waste products will be generated, check here* ☒ *and explain on a supplemental sheet:*

(a) Quantity and type of radioactive waste that will be generated.

(b) Detailed procedures for waste disposal.

14. IF PRODUCTS FOR DISTRIBUTION TO THE GENERAL PUBLIC UNDER AN EXEMPTION CONTAINED IN 10 CFR 40 ARE TO BE MANUFACTURED, USE A SUPPLEMENTAL SHEET TO FURNISH A DETAILED DESCRIPTION OF THE PRODUCT, INCLUDING:

(a) PERCENT SOURCE MATERIAL IN THE PRODUCT AND ITS LOCATION IN THE PRODUCT.

(b) PHYSICAL DESCRIPTION OF THE PRODUCT INCLUDING CHARACTERISTICS, IF ANY, THAT WILL PREVENT INHALATION OR INGESTION OF SOURCE MATERIAL THAT MIGHT BE SEPARATED FROM THE PRODUCT.

(c) BETA AND BETA PLUS GAMMA RADIATION LEVELS (*Specify instrument used, date of calibration and calibration technique used*) AT THE SURFACE OF THE PRODUCT AND AT 12 INCHES.

(d) METHOD OF ASSURING THAT SOURCE MATERIAL CANNOT BE DISASSOCIATED FROM THE MANUFACTURED PRODUCT.

CERTIFICATE

(This item must be completed by applicant)

15. *The applicant, and any official executing this certificate on behalf of the applicant named in Item 1, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 40, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.*

Research Division, W. R. Grace & Co.
(Applicant named in Item 2)

Dated May 22, 1964

BY: J. Jirian

President, W. R. Grace & Co., Research Division
(Title of certifying official authorized to act on behalf of the applicant)

WARNING: 18 U.S.C. Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

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40-2810

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Supplemental Sheet No. 1
Form AEC-2

Research Division
W. R. Grace & Co.,
Clarksville, Maryland

Item 11a: Radiation Detection and Related Instruments

Sampling: Staplex Hi-volume Air Sampler, Model TF1A

Millipore Filter Corp., Air Pump, Model XX 60 000 000 and associated membrane filters.

Detection: Victoreen Cutie Pie Survey Meter, Model 740B, sensitivity range 0-100 mr/hr. window thickness 0.0005 inches Mylar, detects alpha, beta and gamma.

Tracerlab Survey Meters (2), Model SU-14, sensitivity range 0-25 mr/hr. or 0-50,000 cpm, window thickness less than 2 mg/cm^2, detect alpha, beta and gamma.

Eberline Instrument Corp. Gas Proportional Counter Model PAC-3G, range 0-100,000 cpm., detects alpha.

Nuclear Measurements Corp. Windowless Gas Flow Proportional counter, counts alpha, beta and gamma. Range 0-> 100,000 dpm.

Item 11b: Methods, Frequency and Standards Used in Calibrating Instruments Listed in 11a.

Methods: The Victoreen Cutie Pie Survey Meter and the two Tracerlab SU-14 meters are calibrated with a cobalt-60 sealed source at various distances from the source.

The Tracerlab SU-14 meters and the Eberline PAC-3G alpha counter are calibrated by holding a standard alpha source as near as possible to the thin windows, simulating actual surveying.

The Nuclear Measurements proportional counter is calibrated by inserting standard alpha, beta, or gamma sources into the chamber and counting at the proper voltage.

Frequency: All survey and counting instruments are calibrated at least semi-annually with standard sources and tested for proper operation with smaller check sources at each use.

Standards Used:

Alpha - National Bureau of Standards
Uranium Oxide source, Standard Sample No. 4903-201-7-2

Beta - Nuclear Chicago carbon-14 source Model R-20, calibrated against National Bureau of Standards carbon-14 beta-ray standard, Sample No. P4075.

Supplemental Sheet No. 2
Form AEC-2

Research Division,
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Item 11b: Continued

Gamma - Tracerlab R-31, 5 mc. calibrated cobalt-60 source.

Tracerlab R-7, 7.1×10^{-4} mc calibrated cobalt-60 sources are corrected for decay at each calibration.

Permanent records are maintained on all calibrations.

Film badges or dosimeters are not issued because of the low level of beta and gamma radiation from the quantities of source material involved in the operations.

Research Division,
W. R. Grace & Co.,
Clarksville, Maryland

Item 12b:

EMERGENCY PROCEDURES FOR WORK WITH SOURCE MATERIAL

The design of facilities and procedures are such that the spread of contamination would be minimized in the event of an accident involving source material. If an incident should occur in which source material is released, the following emergency procedures are to be followed:

1. Make a quick estimate of the situation and warn other occupants of the room. If any of the material is ariborne, hold your breath and retreat immediately to a safe distance.

2. If you have time, do what you can to avoid the spread of contaminating material.

3. Remove contaminated clothing and put on a clean laboratory coat kept nearby for such emergency. Thoroughly wash exposed parts of your body.

4. Immediately notify the Radiation Protection Officer (RPO), Project Supervisor, and if fire is involved, the Fire Department. Call the Medical Office if medical attention is needed.

5. Evacuate and close off the room, but, unless it is unsafe, remain in the immediate area until you can be checked for contamination.

6. Notify personnel in adjacent areas of the condition. Evacuate these areas if there is any doubt of the spread of contamination.

7. If fire is involved, the project supervisor and the RPO will direct the fire department in an effort to avoid spread of contamination.

8. The Project Supervisor and the RPO will plan and direct decontamination consistent with safety and the nature of the accident. Waste disposal will be done in an acceptable manner.

9. The RPO will perform a survey of the entire area and those areas where contamination may have been carried. Operation will be resumed only after safety is assured, the operation reviewed, and corrective measured taken.

10. The Project Supervisor will make necessary reports to the assigned AEC Operations Office according to the regulations issued for this purpose.

11. Immediate bioassay and mecical examination will be given to personnel involved in the accident.

Supplemental Sheet No. 4
Form AEC-2

Research Division,
W. R. Grace & Co.,
Clarksville, Maryland

Item 12c: Detailed Description of Radiation Survey Program and Procedures

Frequency

All work and storage areas are surveyed at least monthly for alpha contamination in air and on surfaces of benches, floors, desks, etc. Areas are surveyed periodically with an alpha survey instrument to detect fixed contamination.

Sampling

Air samples are taken by drawing a measured volume of air through filter paper impregnated with an antistatic agent.

Smear samples are collected by swiping impregnated filter paper over 1 ft.^{2} areas.

Counting

Both air and smear samples are counted in the NMC windowless proportional counter at the voltage setting which measures only alpha activity.

Quantitation

Counting data are interpreted on the basis of the best available information on filtering efficiency of the paper, and absorption of alpha particles by the paper and dust. Activities are calculated to microcuries per cubic centimeter of air, and dpm/ft.^{2} for smears.

Maximum Permissable Limits

Our maximum permissable limits are set at less than one-half the limits required or recommended in the following publications.

1. CFR, Title 10, Part 20, "Standards for Protection Against Radiation".
2. U.S.A.E.C. Dept. COO-12 (Rev.), "Health and Safety Considerations for Uranium Fuel Fabrication Facilities", by W. A. Brobst., Apr., 1,1958.
3. U.S.A.E.C. Dept. ORNL-332 "Applied Health Radiation Survey Instrumentation" pp. 118-122.

Corrective action is required, and follow-up surveys made when contamination exceeds 50% of the MPL's set forth in these articles.

Effluent Wastes

We have a developed method for measuring contamination in solutions by evaporation of measured volume and counting alpha activity on planchets. However, this procedure is rarely used since company regulations prohibit the disposal of any source material into the sewage system.

Research Division
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Records

Permanent records are maintained for all surveys.

Bioassays

Each worker is given a urinalysis for source material semi-annually, with follow-up action and additional bioassay if the excretion rate exceeds 10% of the MPl recommended by the Health and Safety Div. of the U.S.A.E.C. Chicago Operations Office. Analyses are performed by Nuclear Science and Engineering Corporation, Pittsburgh, Pa. Results are incorporated in the workers permanent medical records. Each worker is also given a complete blood test semi-annually.

Shipment

Shipments of small experimental samples and waste source material are surveyed for gamma radiation and alpha contamination of surfaces. Packages are approved for shipment only if they meet the requirements of applicable postal or ICC regulations. Permanent records are maintained.

Item 13: Waste Products

(a) Quantity and Type of Radioactive Waste that will be Generated.

Wastes are generated in the course of the experimental work in the form of research samples, solutions, sols, and slurries. They correspond in quantity to the scale of the work, e.g., < 1000 g. for laboratory work and a few pounds for development work. They are stored and accumulated to the extent of up to several pounds before recovery.

(b) Detailed Procedures for Waste Disposal

The accumulated wastes are recovered as filter cake by precipitation with ammonia partially dried, and combined according to composition (uranium, thorium). They are packaged and stored until sufficient quantity (20-50 lbs.) to ship for recovery to W. R. Grace associated plants which process nuclear materials (e.g., Erwin plant, Tennessee, Nuclear Fuel Services, or Davison Chemical Co., Pompton Plains, N. Y.).