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Radon Gas, Useful for Medical Purposes, Safely Fixed in Quartz

The problem:

Radon, a gaseous element used as a source of radiation, is commonly enclosed in quartz or glass ampules for localized radiological administration. Should one of these ampules be accidentally broken, the released radioactive gas would contaminate the atmosphere and present a hazard to personnel in the immediate vicinity. This hazard could be eliminated if it were possible to fix the radon in a solid. One method of accomplishing this is to convert the radon into a fluoride, which is a salt of relatively low volatility.

Another solution:

Embed the radon in the walls of quartz or glass ampules by subjecting the gas sealed at a low pressure in the ampules to an ionization process.

How it's done:

A small quantity of radon mixed with an ionizable gas (e.g., oxygen or nitrogen) is sealed in the ampules at a pressure of 2 to 10 mm of mercury. The ampules are then subjected to a Tesla coil discharge to initiate ionization of the gas mixture. The gas is maintained in the ionized state for approximately 3 hours by irradiating the ampules with microwaves from a standard medical diathermy unit. At the end of the process, all of the radon in the gas mixture will be embedded in the walls of the ampules. Radon fixed in quartz ampules by this process could not be removed by heating the ampules at temperatures above 950°C. After a period of decay, however, radon daughters may be driven out of the quartz in a high vacuum at approximately 600°C, leaving pure radon²²² (3.8-day half life) still embedded in the quartz.

Notes:

1. Washing the ampules with water or acids will not remove the embedded radon. The ampules must not be washed with alkaline solutions.

2. This process should be useful for preparing fixed radon sources for radiological treatment of malignancies, without the danger of releasing radioactive gases. If an ampule were to break accidentally, the embedded radon could be recovered for safe disposal by collecting the fragments of the ampule.
3. Additional information is contained in "Noble Gas Compounds", edited with Introductions by Herbert H. Hyman; The University of Chicago Press-Chicago and London. The University of Toronto Press-Toronto 5, Canada. Library of Congress Catalog Number: 63-20907.
4. Inquiries concerning this innovation may be directed to:

Office of Industrial Cooperation
Argonne National Laboratory
9700 S. Cass Avenue
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Reference: B66-10468

Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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