

Radium Targets for the Reactor Production of Alpha-emitting Medical Radioisotopes

Radium 226 ($t_{1/2} = 1600$ years) can be irradiated in a reactor to produce a variety of important medical radioisotopes. These isotopes can be chemically separated and purified after irradiation, and the radium can be recycled for future use. Since radium is highly radioactive, there are unique challenges with using radium as a target material. Also, the chemical properties of radium are not yet fully explored, so stable surrogate materials, such as barium, are used to develop the process. To irradiate radium at the Oak Ridge National Laboratory (ORNL) High Flux Isotope Reactor, it must be in a stable chemical form and in a safe and thoroughly certified target configuration.

Recent efforts at ORNL have focused on the identification and preparation of several radium compounds to be used as target material for irradiation followed by chemical processing to extract the desired product and recover the radium material. Radium in a stable chemical form can be blended into an aluminum pellet cermet and contained within a welded aluminum capsule. Due to the radioactive properties of radium, the material must be handled in a hot cell, which required design, testing, and construction of in-cell welding and certification capability to seal and certify target capsules. The development of a suitable radium target material, pellet fabrication process and capsule welding will be discussed.

Email Address

coppingr@ornl.gov

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Primary author: Dr COPPING, Roy (Oak Ridge National Laboratory)

Co-authors: Mr MARCUS, Chris (ORNL); Dr STRACENER, Daniel (ORNL); Mr DENTON, David (ORNL); Ms HICKMAN, Eva (ORNL); Mr WRIGHT, Joseph (ORNL); Ms MURPHY, Karen (ORNL); Dr MIRZADEH, Saed (ORNL)

Presenter: Dr COPPING, Roy (Oak Ridge National Laboratory)