

SPECTECH

Cs-137/Ba-137m Isotope Generator



Operating Instructions

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Regulatory Information

The Cs-137/Ba-137m isotope generator contains an exempt quantity of radioactive material — Cs-137, up to 10 μ Ci (0.37 MBq) and requires no special handling or storage instructions.

For more information about exempt quantities of radioactive material see the U.S. Nuclear Regulatory Commission (U.S. NRC) website — www.nrc.gov.

NOTE: This source does not exceed the activity set forth in Section 30.71 Schedule B of the U.S. NRC Regulations (the source may be transferred to any individual in the U.S. free of specific licensing requirements); however, it may be licensable material in countries other than the U.S.

Included in Each Kit

- Instruction manual
- Isotope exchange column
- Syringe
- 10 steel sample planchets
- Eluting solution (250 mL)

Additional eluting solution (part no. ELSN) can be ordered from Spectrum Techniques or prepared by the user as 0.9 % NaCl in 0.04 M HCl. When making solution, use distilled or DI water to avoid unwanted mineral contamination.

Disposal

Since the Cs-137/Ba-137m isotope generator contains an exempt quantity of Cs-137, it may be disposed of in the regular trash providing that all the radiation symbols and other identifying marks have been removed or defaced.

NOTE: In countries other than the U.S., disposals will have to comply with local regulations.

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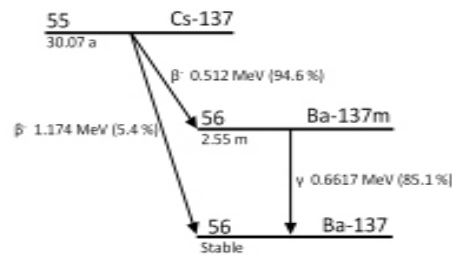


General Information

The Cs-137/Ba-137m isotope generator has been specifically designed for use in schools and universities to demonstrate the physical properties of radioactive decay.

Based on the original Union Carbide design, the isotope generator offers exceptional performance while maintaining ease of use and safe operation.

Cs-137 is a long-lived parent nuclide which has a half-life of 30.07 years and decays by the emission of beta radiation into the stable isotope Ba-137. This transition is completed either by direct conversion into stable Ba-137 (5.4 %) or via the metastable energy state of Ba-137m (94.6 %). Ba-137m has a half-life of 2.55 minutes and decays by isomeric transition, emitting a gamma ray ($E_\gamma = 0.6617$ MeV), into the stable isotope Ba-137.



How it Works

The isotope generator contains up to 10 μCi (0.37 MBq) of Cs-137 bound on a special ion exchange medium. Using an eluting solution (which is forced through the isotope exchange column using a syringe) the Ba-137 is selectively extracted from the ion exchange medium leaving only the Cs-137. This process is called “milking the generator.”

Tests have shown that the isotope generator may be milked many times in quick succession without totally depleting the Ba-137 isotope. Complete equilibrium can be reestablished within one hour.

The recovery of the radioactive equilibrium can be detected using a suitable measurement instrument.

Eluting Procedure

Note: Only qualified instructors should operate the generator. Care should be exercised to avoid spills and contaminating work surfaces.

The following items will be needed:

- Isotope exchange column
- Syringe
- Steel sample planchet
- Eluting Solution
- Work tray
- (recommended - in case of a spill)

- Place the steel sample planchet on a work tray or clean surface.

- Draw approximately 3 mL of the eluting solution into the syringe from the bottle or a suitable container (i.e. flask, beaker).

- Remove the stoppers from both ends of the isotope generator.

- Insert the syringe firmly into the hole on the top of the isotope generator. **Note:** the isotope generator is marked with a flow direction indicator.

- Hold the isotope generator firmly, with its discharging hole facing downward above the steel sample planchet.

- With the isotope generator positioned vertically, force enough eluting solution through the isotope exchange column to push approximately seven drops of Ba-137 onto the steel planchet.

Caution: Do not attempt to draw the eluting solution back through the generator as this may cause the internal filters to rupture. The isotope generator is marked with a flow direction indicator.



- Immediately place the steel planchet, containing the sample, under/near the detector and begin counting for the predetermined count time.
- After use, remove the syringe from the isotope generator and replace the stoppers on both ends.
- Empty any unused eluting solution back into the bottle.

Handling the Eluate

After fifteen minutes, the Ba-137m sample will have decayed more than five half-lives and may be discarded as normal waste.

Caution: If you experience a higher than normal residual count from the sample after 20 minutes of decay, discontinue using the isotope generator and contact Spectrum Techniques.

A high residual count or a brown discoloration of the eluate indicates a loss of the Cs-137 parent from the exchange medium.

Handling Spills

If a spill does occur, the Ba-137m sample will have decayed more than 5 half-lives in 15 minutes (10 half-lives in 30 minutes).

Working Life of the Isotope Generator

Cs-137 has a half-life of 30.07 years. The working life of an isotope generator is more likely to be limited by things, such as:

- Impurities which might obstruct the filters (usually getting into the generator with the eluting solution).
- Loss of Cs-137 from the isotope exchange column.

Note: The generator may also be used for experimental purposes as a gamma emitter. The beta radiation emitted by the Cs-137 is not detectable outside the generator capsule; however, the gamma radiation emitted by the Ba-137m can be seen.