

Nickel-63

Handling Precautions

^{63}Ni
100 y
 β^- 0.066
No γ
E 0.066

Physical Data

Maximum Beta Energy: 0.066 MeV (100%)⁽¹⁾

Maximum Range of Beta in Air: 5 cm (2 in.)⁽²⁾

Occupational Limits⁽³⁾

Annual Limit on Intake: 9 mCi (330 MBq) for oral ingestion and 800 μCi (30 MBq) for inhalation.

Derived Air Concentration: 3×10^{-7} $\mu\text{Ci}/\text{ml}$ (11 kBq/m³).

Dosimetry

Millicurie (37 MBq) quantities of ^{63}Ni do not represent a significant external exposure hazard since the low energy betas emitted cannot penetrate the outer dead layer of skin. It may be assumed that 2% of ^{63}Ni uptake transfers to the kidney where it is retained with a biological half-life of 2 days; 68% is directly excreted; and 30% is uniformly distributed throughout all organs and tissues of the body including the kidneys, and retained there with a biological half-life of 1200 days⁽⁴⁾.

PerkinElmer Life Sciences has developed the following suggestions for handling Nickel-63 after years of experience working with this low-energy beta emitter.

General Handling Precautions for Nickel-63

1. Designate area for handling ^{63}Ni and clearly label all containers.
2. Prohibit eating, drinking, smoking and mouth pipetting in room where ^{63}Ni is handled.
3. Use transfer pipets, spill trays and absorbent coverings to confine contamination.
4. Handle ^{63}Ni compounds which are potentially volatile or in powder form in ventilated enclosures.
5. Sample exhausted effluent and room air by continuously drawing a known volume through membrane filters.
6. Wear disposable lab coat, wrist guards and gloves for secondary protection.
7. Select gloves appropriate for chemicals handled.
8. Maintain contamination control by regularly monitoring and promptly decontaminating gloves and surfaces.
9. Use open-window Geiger-Mueller detector, NaI(Tl) detector or liquid scintillation counter to detect ^{63}Ni .
10. Submit periodic urine samples for bioassay to determine uptake by personnel.
11. Isolate waste in sealed, clearly labeled containers and dispose according to approved guidelines.
12. Establish surface contamination, air concentration and bioassay action levels below regulatory limits. Investigate and correct any conditions which may cause these levels to be exceeded.

13. On completing an operation, secure all ^{63}Ni ; remove protective clothing; dispose of protective coverings; monitor and decontaminate self and surfaces; wash hands and monitor them again.

Many ^{63}Ni compounds cannot be detected with sufficient sensitivity by liquid scintillation counting of small volume urine samples. If insoluble compounds are handled, 24-hour urine samples should be periodically collected and radiochemically analyzed to ensure that contamination controls are adequate.

References

1. Kocher, David C., Radioactive Decay Data Tables, Springfield: National Technical Information Service, 1981 DOE/TIC-11026.
2. Kaplan, Irving, Nuclear Physics, New York: Addison-Wesley, 1964.
3. U.S. Nuclear Regulatory Commission. 10CFR 20 Appendix B – Standards for Protection Against Radiation, 1994.
4. ICRP Publication 30, Part 3, Limits for Intakes of Radionuclides by Workers. Pergamon Press, Oxford, 1981.

This document contains general information designed to provide a basic understanding of radiation safety. While we believe the information to be accurate, regulatory requirements may change and information contained herein is not tailored to individual needs. A radiation protection specialist should be consulted for specific applications.



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