



# NICKEL-63 BETA SOURCES

NRD nickel-63 ( $^{63}\text{Ni}$ ) sources are suited for such applications as ionization sources for high temperature gas chromatography cells; high output, low-energy beta or ionization sources; and low-energy bremsstrahlung sources.  $^{63}\text{Ni}$  sources are particularly advantageous where usage demands:

- Low-energy, short range radiation.
- Sufficient activity to generate ionization current within the optimum operating range of a detection apparatus.
- Sufficiently slow rate of decay (long half-life) to provide constant ionization current over long periods.
- Low noise or high signal to noise ratio.
- Stability at elevated temperature.
- No loss of activity due to exchange phenomena or other reactions in normal situations not involving abrasive or corrosive environmental conditions

## $^{63}\text{Ni}$ CHARACTERISTICS

Half-Life: 125 Years

Radiation Emitted: Beta - 0.067 MeV (maximum)

Gamma - See General Information

Other – Secondary

## FABRICATION

$^{63}\text{Ni}$  is deposited on a substrate such as 0.006 in. - 0.008 in. gold foil (standard backing). The isotope can be deposited on all exposed surfaces of the gold substrate or on selected portions. Other backing materials will be considered upon request.

## CONCENTRATIONS

Optimum ionization output is obtained at 20 – 30 millicuries (mCi)  $^{63}\text{Ni}$  per square inch of active area. Other concentrations per unit area available upon request.

## IONIZATION CURRENT

When plated at the recommended concentration,  $^{63}\text{Ni}$  produces approximately  $1 \times 10^{-9}$  amperes per mCi. Typical 1 in. x 1 in. foils, plated on one face with 20 mCi high specific activity  $^{63}\text{Ni}$ , produce ion currents of 1.8 -  $2.2 \times 10^{-8}$  amperes (parallel plate ionization chamber, 6 in. diameter plates, 1.5 in. air gap, applied potential 2000 volts).

## TEMPERATURE RESISTANCE

Typical sources are able to withstand temperatures of 400°C - 450°C for prolonged periods with no detectable loss of  $^{63}\text{Ni}$  and with no loss in ionization efficiency. No evidence of cracking or flaking of the active deposits was observed after the tests in the above temperature range.

## GENERAL INFORMATION

Gamma impurities present in the active deposit are generally less than 1 part in 10<sup>6</sup>; the specific value is variable depending on the history of the  $^{63}\text{Ni}$  stock. The normal level of gamma impurities is inconsequential in ionization applications, such as in the chromatography detector cell. It may, however, be of significance in other specialized usage.

## PERFORMANCE LIFE

No detectable change in performance characteristics has been observed after thousands of hours of continuous use in gas chromatography detector cells engaged in routine analytical operations. Test results indicate the probability of an effective source life of many years in all similar applications, not involving extreme or abrasive environments.

## STORAGE

Store sources in a dry environment.

## SERVICE

NRD DOES NOT recommend customers attempt to remove or clean the foil in situ. A minute fraction (microcurie levels) of the activity present may possibly be abraded from a bare  $^{63}\text{Ni}$  source surface by rubbing vigorously with, for example, moistened cottontipped swabs or filter paper. However, we do offer the following services to  $^{63}\text{Ni}$  users:

- Testing and evaluation of foils
- Foil replacement
- Foil disposal

Please call for a price quotation and return authorization number.

## SHIPPING INFORMATION

Sources 1.5 in x 0.5 in. size with 10 mCi or 15 mCi  $^{63}\text{Ni}$  activity are available from stock material within about 10 days of receipt of order. In most other instances, sources are prepared to order on three to four weeks delivery.

NRC license is necessary. Information and partially completed application forms are available upon request.