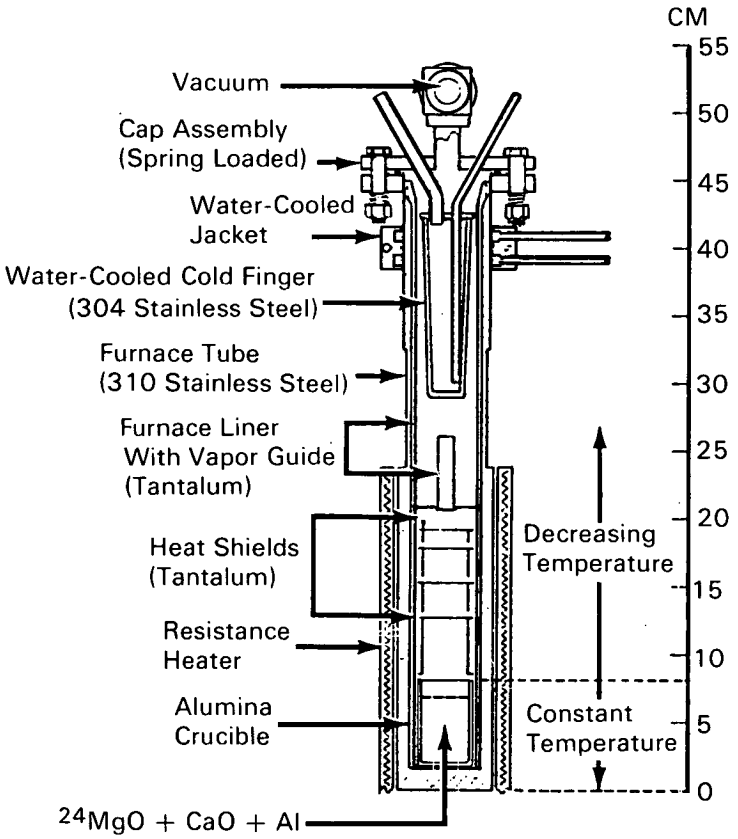
AEC-NASA TECH BRIEF

Isotopically Pure ^{24}Mg Is Prepared From ^{24}MgO



The problem:

To prepare isotopically pure ^{24}Mg, suitable for use in neutron scattering and polarization experiments. Because of the value of the pure ^{24}MgO starting material, the method used must assure a high product yield.

The solution:

An apparatus (see diagram) which permits thermal reduction of ^{24}MgO with aluminum and CaO, and subsequent vaporization of the product metal in vacuum according to the equation:

$$3MgO + CaO + 2Al \rightarrow 3Mg\uparrow + CaO{\cdot}Al_2O_3$$

How it's done:

The apparatus used for the ^{24}MgO reduction consists of a resistance-heated furnace tube and cap assembly. The tube contains an aluminum oxide crucible for holding the feed charges, tantalum radiation

(continued overleaf)

shields, a tantalum liner with a vapor guide, and a water-cooled cold finger for collection of the vaporized magnesium.

The charges to the reduction furnace are in the form of pellets prepared from a stoichiometric mixture of ^{24}MgO and CaO together with aluminum in excess of the amount necessary. The pellets are outgassed at 5×10^{-4} torr at a temperature between 600° and 700°C, then heated to 1150°C and held at this temperature for 2 hours to effect ^{24}MgO reduction and product distillation.

Notes:

1. Product yields of ^{24}Mg are reported for 7 runs to be 98.3% (std. dev. ±1.2%). Mass spectrometric analyses of product samples showed that the at% of magnesium isotopes to be: ^{24}Mg, 99.91±0.01; ^{25}Mg, 0.06±0.01; ^{26}Mg, 0.03±0.01.
2. Additional details are contained in "Preparation of ^{24}Mg from ^{24}MgO," by N. R. Chellew, R. K. Steunenberg, and J. D. Schilb, Argonne National Laboratory, which was published in *Nuclear Instruments and Methods*, 44 (1966), p. 149–150.
3. Inquiries concerning this innovation may be directed to:

   Office of Industrial Cooperation
   Argonne National Laboratory
   9700 South Cass Avenue
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   Reference: B68-10293

Source: N. R. Chellew,
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Patent status:

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

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