

FIG. 1. Raman spectrum of normal (a) and isotopically enriched (65%  $^{18}\text{O}$ ) (b) crystalline  $\text{KBrO}_3$ .

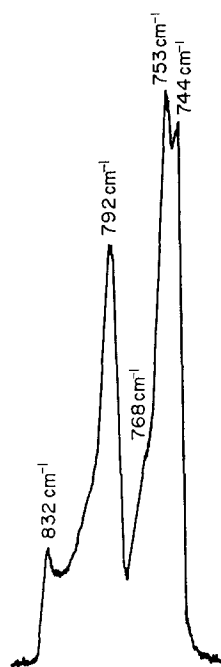


FIG. 2. Raman spectrum of isotopically enriched  $\text{KBr } ^{18}\text{O}_3$ . After irradiation in air showing relative changes in peak heights.

not correspond to the calculated splitting reported in the literature<sup>(3)</sup> and it would appear therefore that the published force constant data are in error.

Figure 2 is the spectrum of  $\text{KBr } ^{18}\text{O}_3$  irradiated in air. As can be seen the  $792\text{ cm}^{-1}$  ( $\text{KBr } ^{16}\text{O}_3$ ) peak has substantially increased (due to the radiation induced exchange with atmospheric  $\text{O}_2$ ). The  $^{18}\text{O}$  concentrations in the two samples are shown in Fig. 1(b) and Fig. 2 calculated according to reference<sup>(6)</sup> are found to be 65.6 and 57.0% respectively. The nature of the spectra was such as to make quantitative calculations difficult, however, considering this fact the agreement with the vendors' specifications of "approximately" 70%  $^{18}\text{O}$  is very good.

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EARL W. HOLTZSCHEITER  
EVERETT R. JOHNSON

*Department of Chemical Engineering,  
University of Maryland,  
College Park, Maryland 20742, U.S.A.*

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### Dry Distillation Separation of Carrier-Free I-131 from Reactor Irradiated $\text{Mg}_3\text{TeO}_6$

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IODINE-131 is frequently prepared by irradiation of  $\text{TeO}_2$  in a reactor. The  $^{131}\text{I}$  is isolated by dry distillation, which requires only a simple apparatus and does not produce liquid waste.<sup>(1-4)</sup> However, when

large amounts of  $\text{TeO}_2$  are used the distillation time tends to be long, which causes a reduction in the separation yield. During long irradiations the  $\text{TeO}_2$  powder sinters in the reactor. The temperature to which the  $\text{TeO}_2$  may be raised is limited by the fairly low melting point and the tendency to decompose into tellurium and oxygen.

We have used  $\text{Mg}_3\text{TeO}_6$  as a target material. It has a high thermal and radiation stability and may be heated to temperatures up to  $880^\circ\text{C}$ . The low cross-section of Mg (0.06 barn) makes the parasitic neutron capture negligible.

#### Thermoanalysis of $\text{Mg}_3\text{TeO}_6$

Thermo-gravimetric measurements on our  $\text{Mg}_3\text{TeO}_6$  showed a weightloss of 4.3% up to  $630^\circ\text{C}$ , presumably due to loss of water. From  $630$  to  $880^\circ\text{C}$  the weight remains constant, but above  $880^\circ$  sublimation or decomposition occurs. A noticeable evolution of heat takes place at  $630^\circ$  together with a structural change resulting in the formation of well-defined crystals. This effect is specially important of the  $\text{Mg}_3\text{TeO}_6$  has been compressed under 1500–2000 atm to prepare a sample suitable for reactor irradiation.

#### Recovery of $^{131}\text{I}$ from irradiated $\text{Mg}_3\text{TeO}_6$

A quantity of 80–100 g  $\text{Mg}_3\text{TeO}_6$  was irradiated in a reactor in a thermal neutron flux of  $2.5 \times 10^{13}$  n/cm<sup>2</sup>/sec for 250 or 300 hrs. The irradiated rod-shaped target was heated at different temperatures in a slow stream of air. (The temperature was raised in steps of 50 or  $100^\circ\text{C}$  and maintained at each temperature for 15 min.) Results are shown in Fig. 1.

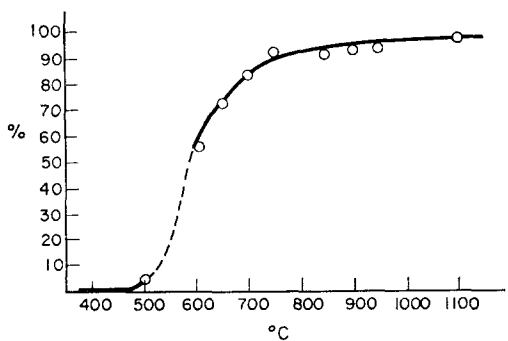


FIG. 1. Percentage of  $^{131}\text{I}$  released in 15 min at different temperatures.

It is seen that the release rate becomes considerable around  $600^\circ\text{C}$ . It seems reasonable to attribute this evolution of  $^{131}\text{I}$  to the structural rearrangement

observed at  $630^\circ$  rather than to solid phase diffusions. Special experiments have shown that at  $700^\circ\text{C}$  between 90 and 95% of the  $^{131}\text{I}$  are recovered within 20–30 min. Analysis of the trapping solution (0.5 to 1%  $\text{NaHCO}_3$ ) has shown that it contained less than  $1 \mu\text{g/ml}$  of tellurium. By paper electrophoresis it was found that less than 2% of the  $^{131}\text{I}$  was present in the non-iodide form.

The method has been used for the routine production of  $^{131}\text{I}$  at a multi-curie level.<sup>(5)</sup>

G. TÓTH  
L. REPAS  
G. FÁBIÁN

*Institute of Isotopes of the Hungarian  
Academy of Sciences  
Budapest, Hungary*

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#### Determination of the Half-Life of $^{103}\text{Pd}$

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**Summary**—THE HALF-LIFE of  $^{103}\text{Pd}$  was measured with a  $0.5 \text{ cm}^3$  Ge(Li) detector, a 2 mm thin NaI(Tl) crystal and a  $4\pi$ -proportional flow counter. Sources of high radiochemical purity prepared from Pd powders of various origins were used. The final result for the half-life is  $(16.961 \pm 0.016)$  days.

#### Introduction

$^{103}\text{Pd}$  DECAYS in 99.95% of the transitions by electron capture to  $^{103}\text{Rh}^m$  which subsequently decays by emission of a strongly converted 40 keV  $\gamma$ -ray to the  $^{103}\text{Rh}$  ground state. Therefore, it seems that a  $^{103}\text{Pd}$  source should be an ideal long-lived reference source for  $^{103}\text{Rh}^m$  ( $T_{1/2} = 56,116$  min) activity determination.<sup>(1–10)</sup>

Since the agreement between previously reported half-life data<sup>(11–16)</sup> is unsatisfactory, a re-determination was undertaken (Table 1). Sources of high