Title
A NEW RADIOACTIVE ISOTOPE OF ERBIUM

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Publication Date
1950-06-09

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BERKELEY, CALIFORNIA

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Geoffrey Wilkinson, Harry G. Hicks

June 9, 1950

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A NEW RADIOACTIVE ISOTOPE OF ERBIUM

Geoffrey Wilkinson, Harry G. Hicks*

June 9, 1950

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Very pure dysprosium oxide was bombarded with 38 Mev α particles from the 60 inch Crocker Laboratory cyclotron and the rare earth elements subsequently chemically separated by the ion exchange resin column method.(1) The holmium

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(1) G. Wilkinson, H. G. Hicks, Phys. Rev. 75 1370 (1949)

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fraction was found to contain mainly the well known beta particle emitting 27.0 hour Ho^{166} activity, together with weak long lived activity probably due to Ho^{162} and Ho^{163}. The activity could be formed by both α,p reaction on Dy^{163} and by α,pn, reaction on Dy^{164}; the gross yield from natural dysprosium was approximately 10^{-3} barns.

The erbium fraction contained a new activity whose decay, followed through six periods, gave a half life of 11.2 ± 0.2 hours. The aluminum, beryllium and lead absorption curves showed the radiations to consist mainly of electromagnetic radiations corresponding to the average energies of holmium L and K x-radiation, 7.2 Kev and 52 Kev respectively, hard gamma radiation of 1.1 Mev energy and very soft electrons of total range ~10 mg/cm^2 aluminum (~80 Kev) in very low yield. The ratios of the various radiations, correcting for absorption in counter window, etc. and assuming counting efficiencies in the standard argon-alcohol tubes used of 10% and 0.5% respectively,

with fluorescence yields of 0.5 and 0.8 for L and K x-radiation respectively, are approximately e^-: L x-ray: K x-ray: 1.1 Mev γ ray = $\sim 10^{-3}$: $\sim$ 0.5:1:$\sim$ 0.2. Possible allocations for the new isotope are masses 161, 163 or 165, since Er^{162} and Er^{164} are stable. The yield, assuming K x-radiation to represent disintegration by orbital electron capture, is too high for production from Dy^{160} and corresponds to the yield to be expected for an α,3n reaction with a cross section of $\sim$ 0.8 barns in one of the more abundant dysprosium isotopes. Since no 11 hour activity, indeed no activity at all of half-life greater than one hour, was detected in the column separated erbium fraction from holmium bombarded with 19 Mev deuterons, allocation of the 11 hour activity should be made to Ho^{163}. This is confirmed by detection of an activity of $\sim$ 5 days half life identified as the 5.1 day Ho^{163} (2) in the erbium sample after decay of the 11 hour activity.

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(2) G. Wilkinson, H. G. Hicks. "Radioactive Isotopes of Terbium and Holmium." Phys. Rev. (in press).

This work was sponsored by the Atomic Energy Commission.