LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the eighteenth of the preceding month, for the second issue, the third of the month. Because of the late closing dates for the section no proof can be shown to authors. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

Radio Isotopes of Nickel

2.6-hour Ni^{63}

The early observations[1, 2] of a radioactivity of a few hours half-life induced in nickel by slow neutrons has been rather definitely identified as due to Ni^{63} through the work of Oeser and Tuck[3] with slow neutrons and that of Heyn[4] with fast and slow neutrons. It has also been produced by the bombardment of copper with neutrons,[3, 4] and of zinc with neutrons.[4] Chemical identification has been made in all these cases. The half-life is quoted as 2.5 and 2.66 hours. It is rather surprising, therefore, that this period should not have been found by Thornton[5] after bombarding nickel with 5 Mev deuterons, since its presence is to be expected, if due to either Ni^{63} or Ni^{65}. Only a positron emitting isotope of copper was found, presumably Cu^{61}, with a half-life of 3.4 hours; the activities in the nickel and cobalt precipitates were disregarded, as their intensities were only 0.01 and 0.005 that of the copper.

This note is to point out that the deuteron bombardment of nickel does produce the nickel activity as well as that of the copper (and in addition a cobalt period of some months' half-life on which we shall report later). The exposure of nickel for four hours to 100 microamperes of 5.5 Mev deuterons yields a chemically identified nickel isotope of half-life 2.6 ± 0.03 hours; the emitted particles are negative electrons which are absorbed to half-value by 0.13 gram/cm² Al and which have a range of 0.90 ± 0.1 gram/cm² Al, indicating a maximum energy of 1.9 Mev, by Feather's relation.[6] The gamma-rays are absorbed to half-value by 10.8 grams/cm² Pb, equivalent to an energy of 1.1 Mev, according to the data of Gentner.[7] Heyn's value for the half-thickness of the electrons from the neutron-produced activity is 0.10 gram/cm². The identification with this previously known period seems to be complete.

We cannot give an exact estimate of the intensity ratio of the Ni^{63} and Cu^{61} activities, since only part (perhaps one-quarter) of the voluminous nickel dimethylglyoxime precipitate was followed. The extrapolated initial intensity of this fraction of the nickel was 3.4×10^5 times background, while that of the entire copper precipitate was 4.0×10^6 times background (approximately 4 millicuries).

The production of this 2.6-hour nickel through the reaction $Ni^{62}(d,p)Ni^{63}$ may alter the interpretation of the excitation function for Cu^{61} produced by $Ni^{60}(d,n)Cu^{61}$ as given by Thornton,[5] since a chemical separation was not performed on the stack of nickel foils used to determine the activation probability. It is difficult for us to understand why the gamma-ray from Ni^{63} was not observed by Richardson[8] in his examination of the gamma-rays from a deuteron-on-nickel bombardment, unless a chemical separation for copper and nickel was made, which is not so stated.

Our neutron bombardments of nickel have not disclosed any nickel periods shorter than the 2.6-hour activity; short periods from deuteron irradiations of nickel have not been looked for.

36-hour Ni^{57}

We wish to report a new radioactive isotope of nickel, formed as the result of the exposure of iron to several microampere hours of bombardment with helium ions at 12.6 Mev and also at 16 Mev. The chemically separated nickel emits positrons with a half-life of 36 ± 2 hours. Absorption measurements on the particles indicate a half-value thickness of 0.034 gram/cm² Al and a range of 0.25 ± 0.05 gram/cm² Al, corresponding to a maximum energy of 0.67 ± 0.1 Mev by Feather's relation.[6] A gamma-ray is also evident, probably annihilation radiation.

The only unstable nickel isotopes that could be formed from iron by the $Fe(\alpha,n)Ni$ reaction are Ni^{57} and Ni^{59}. The lightest stable nickel is Ni^{58} (abundance 68 percent), so that if the 36-hour period were due to Ni^{59}, it should be produced by slow neutrons or deuterons on nickel. We have not been able to detect this activity after strong irradiation of nickel with deuterons or slow neutrons, so we feel justified in ascribing the activity to Ni^{57} through $Fe^{54}(\alpha,n)Ni^{57}$, followed by positron decay to stable Co^{57}. With fast neutrons (from lithium plus deuterons) on nickel, we have found a weak and somewhat doubtful indication of the period, intermixed with some longer lived activities, so that possibly the reaction $Ni^{58}(n,2n)Ni^{57}$ has also been observed.

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J. J. Livingood
G. T. Seaborg

Radiation Laboratory, Department of Physics, (J. J. L.)
Department of Chemistry, (G. T. S.)
University of California,
Berkeley, California,
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