

: Mound Laboratory, Miamisburg, Ohio

MOUND LABORATORY-MONSANTO
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: September 1959

: J. F. Kichelberger

: Research Director

: Krypton Discussions at LRL
on September 3, 1959.

We reviewed the krypton isotope problem with Robert A. Da Roza and discussed gas samples that would be desirable for critical tests at LRL.

The primary interest is in krypton-80 which has an 11.4 Mev threshold for the n, 2n reaction to form the radioactive product krypton-79. For the neutrons from the D + T reaction, the cross-section is estimated at 450 millibarns. However, krypton-78 has a thermal neutron capture cross-section of two (2) barns and competes in the formation of krypton-79. During an explosion of a device there is a preponderance of fast neutron flux and very likely the krypton-78 absorption cross-section follows the 1/v law. The existence of resonances in either of these two reactions are not known. Thus, it is difficult to establish exact isotopic composition requirements until additional information is obtained.

If the neutron cross-sections turn out to be favorable and krypton-80 can be supplied in desired quantities and purity, it would be used as a measure of the thermonuclear yield or efficiency of a device. Krypton-85 is one of the high yield products of fission and is used as an indicator of fission efficiency. Since fission does not contribute to the formation of krypton isotopes of mass number less than 83, the formation of krypton-79 can be correlated to the thermonuclear yield.

Initially, two test samples are needed to study neutron cross-sections. Namely:

1. About 60 milliliters of krypton with a krypton-78 content of 10 to 20 per cent. Also, it is desirable to have the krypton-79 yield from krypton-78 to be greater, compared to that from krypton-80. For the excitation curves for neutron energies below 11.4 Mev, this is not a problem.

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Krypton Discussions at LRL on 9-3-59

Research

1. (Continued)

For the 14 Mev neutrons from the D + T reactions the limitation on krypton-80 is yet to be determined.

2. About 60 milliliters of krypton with a ratio of krypton-80 to krypton-78 of the order of 10 to 1. The relative abundance of krypton-80 in this sample is not critical for the fast neutron cross-section studies.

Diagnostic tests conducted with atomic weapons, each would require about five (5) liters of krypton with isotopic composition specifications to be determined from the test samples.

No time schedule has been established for the delivery of the test samples. However, we indicated that we would be able to work on this problem in the near future and there was a good possibility that one or both of these samples could be provided by the end of 1959.



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