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[3]L. A. Sliv and I. M. Band, Tables of Internal Conversion Coefficients (Academy of Sciences of the U.S.S.R. Press, Moscow, 1958), Part II.

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OXYGEN-20*

Nelson Jarmie and Myron G. Silbert
Los Alamos Scientific Laboratory, University of California,
Los Alamos, New Mexico
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This is a preliminary report of the observation of the nuclide O^{20}, heretofore unknown. This isotope of oxygen is of interest because it is new, because it is a member of the group of nuclides with a closed shell of eight protons, and particularly because it is the lightest nucleus known with isotopic spin $T=2$.

We observed O^{20} by detecting the protons from the $O^{18}(t,p)O^{20}$ reaction. The experimental arrangement and equipment have been described in detail previously.[1] Briefly, 2.6-Mev tritons from an electrostatic accelerator bombard a gas target enriched in O^{18}. Reaction fragments are analyzed in a double-focussing magnetic spectrometer and are detected in a CsI crystal scintillation spectrometer. The varying sensitivity of the CsI to different particles and the momentum analysis of the fragments determine the mass and energy of these fragments. As an additional check that the fragments in the O^{20} reaction were protons, their behavior was observed when a thin aluminum foil was placed over the CsI crystal. Protons from targets of normal oxygen, 25% O^{18},[2] and 96% O^{18} were observed. Background runs were also taken with nitrogen and methane in the target to check on possible contaminant reactions. All target gases were analyzed with a mass spectrometer. To eliminate the possibility that the proton groups could have come from (He^3,p) reactions caused by the He^{3+} component of the beam, runs were taken using a HT^+ beam. It was shown that the results below were definitely from the $O^{18}(t,p)O^{20}$ reaction.

Two proton groups associated with O^{20} were observed. These are assumed to be due to the ground state and first excited state of O^{20}. The Q for the reaction $O^{18}(t,p)O^{20}$ is 3.12 ± 0.04 Mev. This then gives a preliminary value for the mass of O^{20} of 20.01036 ± 0.00004 amu or a mass excess of 9.65 ± 0.04 Mev. The beta disintegration energy[3] for the O^{20}-F^{20} decay is calculated to be 3.75 Mev. The first excited state of O^{20} is found to be at an energy of 1.70 ± 0.05 Mev above the ground state. No other energy level was seen up to about 4.05 Mev. The errors stated are standard deviations.

This mass for O^{20} indicates a more stable nucleus than has been expected. For instance, Talmi and Thieberger[4] with a shell-model calculation predicted a mass excess of 11.4 Mev. The measured mass of O^{20} corresponds to a 6.5-Mev excited level in F^{20} and to a 16.7-Mev level in Ne^{20}. These levels should be the positions of the first $T=2$ state in these nuclei.

More precise values on O^{20}, as well as information on the energy levels of O^{18}, N^{16}, and N^{17}, will be reported in a complete paper.

Our thanks go to Eugene Haddad for some helpful advice on this experiment.

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[2]The 25% O^{18} was kindly furnished by A. O. Nier, University of Minnesota.

[3]See S. Katcoff and J. Hudis, J. Inorg. Nuclear Chem. 3, 253 (1956), for an attempt to measure the O^{20} half-life.

[4]I. Talmi and R. Thieberger, Phys. Rev. 103, 718 (1956).