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$^{17}O(\vec{p},t)^{15}O$ at E_p = 90 MeV AS A TEST FOR SEQUENTIAL PICKUP ASPECTS

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Zero or finite range one-step DWBA calculations for two-nucleon transfer processes can account for angular distributions and their L dependence as well as for effects due to selection rules. However, one does not reproduce absolute cross sections or the observed J dependence of analyzing powers for a given L using even very sophisticated one-step approaches. Recent analyzing power measurements ($^{207}Pb(\vec{t},p)$, $^{48}Ca(\vec{t},p)$ [Ref. 1], and $^{90}Zr(\vec{p},t)$ [Ref. 2] could be understood qualitatively by including important sequential transfer channels explicitly. To study the effects of sequential two-nucleon transfer mechanisms at medium energy in a simple nucleus, we chose ^{17}O as a target for our (p,t) experiment as the nuclear wave functions near the p-shell closure are considered to be well understood. The measurements were made with the IUCF QDDM Spectrometer using SiO_2 targets enriched to 55% ^{17}O, 25% ^{18}O, and 20% ^{16}O. In order to distinguish final states of ^{15}O from those of ^{16}O we also took data with an almost pure ^{18}O target (SiO_2 enriched to 95% ^{18}O). The beam energy (E_p=90 MeV) was chosen to match the capabilities of the magnetic spectrometer. The average beam polarization was about 75% for both spin directions.

The triton spectrum for the two momentum bites of the spectrograph taken at Θ_{lab} = 10° is shown in Fig. 1.

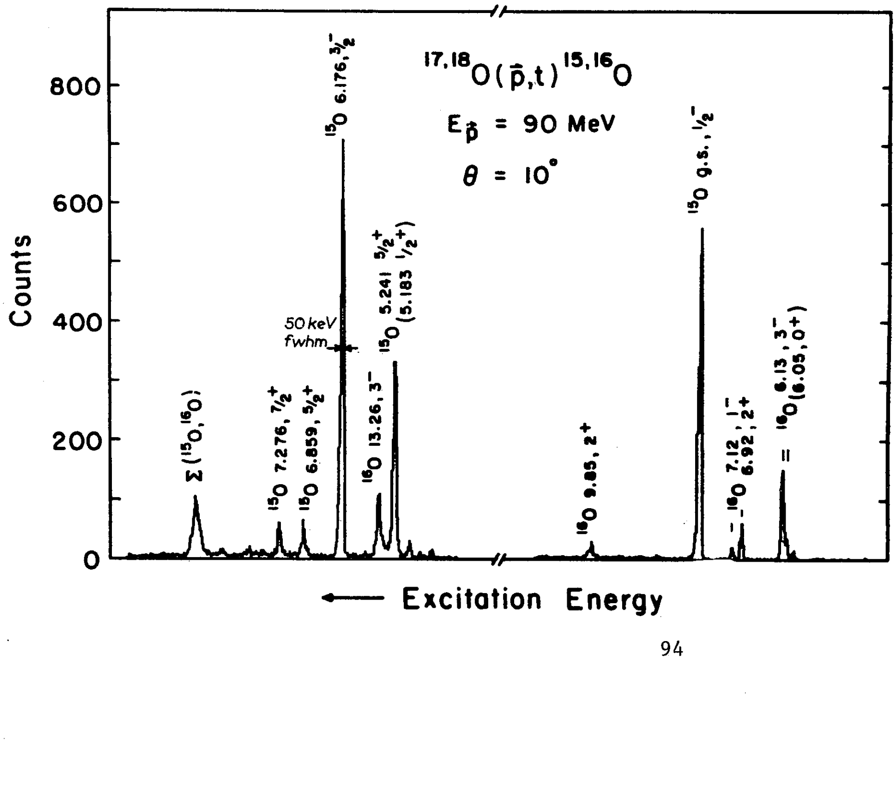

Figure 1. Triton spectrum from $^{17,18}O(\vec{p},t)^{15,16}O$ for the two spectrograph settings at Θ_{Lab}=10°.

With the resolution obtained of about 50 keV, the doublet of ^{15}O at 5.183($1/2^+$) and 5.241($5/2^+$) should have been clearly resolved. As can be seen, only the 5.241-MeV state shows up strongly in the spectrum. Angular distributions of cross sections and analyzing powers were measured in 5° steps from 5° to 55° and are shown in Fig. 2. A NaI monitor telescope was mounted at Θ_{Lab}=12° for most runs of the experiment to assure the stability of the targets. The target thickness normalization was confirmed by separate elastic proton scattering results which were compared to measurements with a mylar target of known thickness and to optical model calculations. The absolute cross sections are estimated to be accurate to about 15%. We note that the analyzing powers inparticular show some variation from state to residual state. Preliminary exact finite range one-step calculations with the code FRUCK2 are included in Fig. 2 for some states. Coupled channels calculations for the various cases are in progress.

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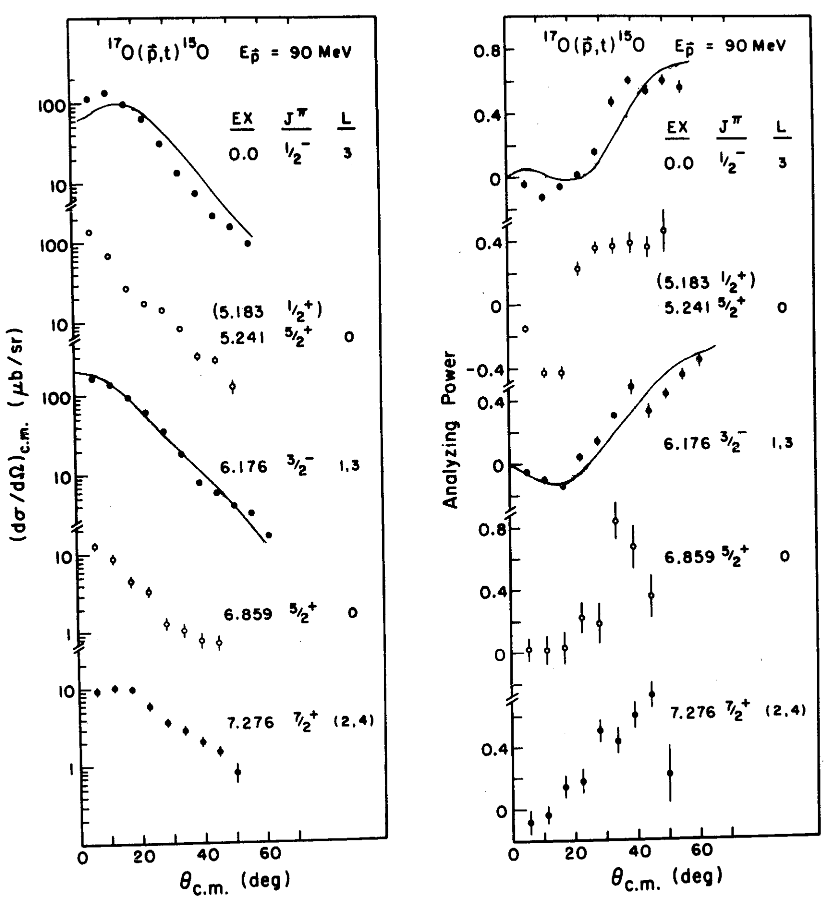

Figure 2. Angular distributions of cross sections and analyzing powers. Solid lines are preliminary FRUCK2 calculations.