STUDIES OF $^{18}O(\vec{p},\pi^-)^{19}Ne$ AND $^{26}Mg(\vec{p},\pi^-)^{27}Si$

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The $^{18}O(p,\pi^-)$ and $^{26}Mg(p,\pi^-)$ reactions exhibit a selectivity similar to that observed for a number of targets in the C, Ca and Zr mass regions.[1] The reaction strength is concentrated in final states having stretched two-particle one-hole configurations with respect to the target nucleus. This is an expected feature of a two-nucleon reaction mechanism.

Data for the $^{18}O(p,\pi^-)^{19}Ne(4.6$ MeV) and $^{26}Mg(p,\pi^-)^{27}Si(9.5$ MeV) transitions have been reported previously.[2] The angular distributions of the differential cross sections and analyzing powers for these two transitions are strikingly similar in both magnitude and shape.

During 1983 data for the $^{18}O(p,\pi^-)^{19}Ne(2.79$ and 10 MeV) and $^{26}Mg(p,\pi^-)^{27}Si(7.0$ MeV) transitions were analyzed. The results are shown in Figs. 1 and 2. The general behavior of the $^{19}Ne(10$ MeV) and $^{27}Si(7.0$ MeV) data is similar to that reported previously[2] for $^{19}Ne(4.6$ MeV) and $^{27}Si(9.5$ MeV), but the behavior of the $^{19}Ne(2.79$ MeV) differential cross section data is

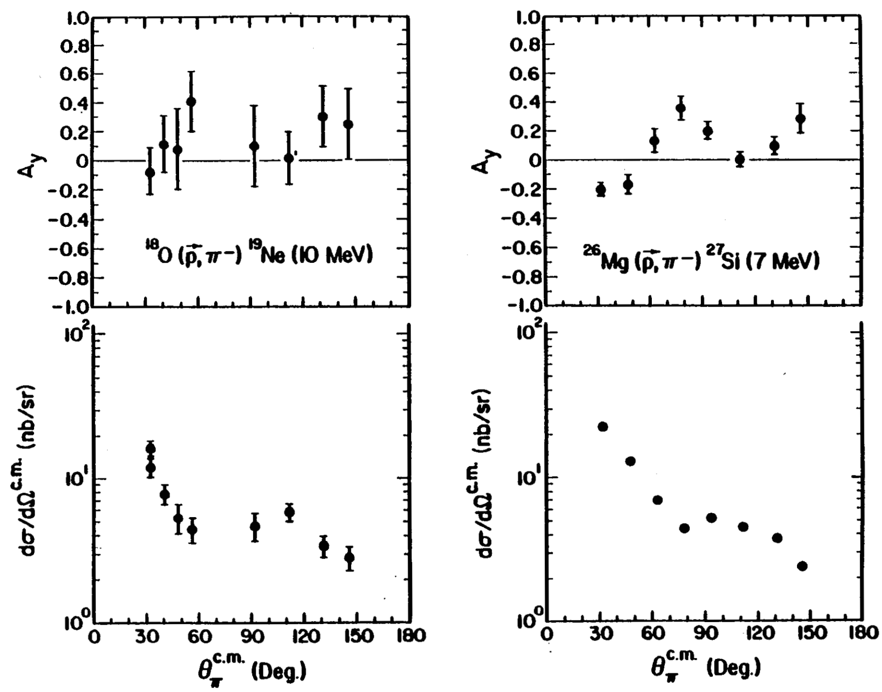

Figure 1. Center-of-mass differential cross section and analyzing power angular distributions for the reactions $^{18}O(p,\pi^-)^{19}Ne$ (10 MeV) and $^{26}Mg(p,\pi^-)^{27}Si$ (7 MeV), both at T_p^{lab} = 201 MeV.

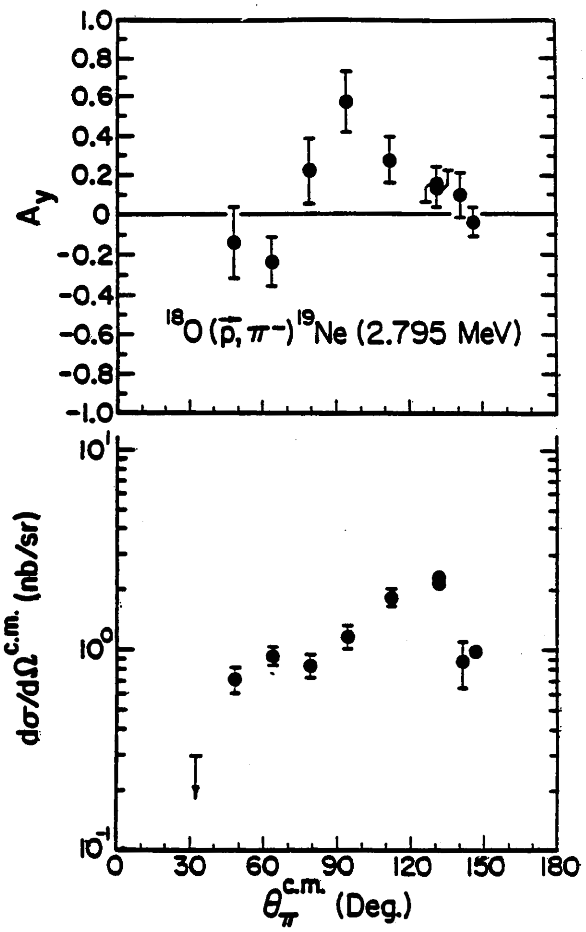

Figure 2. Center-of-mass differential cross section and analyzing power angular distributions for the reaction $^{18}O(p,\pi^-)^{19}Ne$ (2.795 MeV) at $T_p{}^{lab}$ = 201 MeV. The 32.5° point indicates an upper limit for the cross section.

entirely different from the other cases; for ^{19}Ne(2.79 MeV) the differential cross section peaks at backward rather than forward angles.

There are known[3,4] $13/2^+$ states in ^{19}Ne at 4.64 MeV and approximately 10 MeV, which we associate with the strong peaks in the $^{18}O(p,\pi^-)^{19}Ne^*$ spectrum. Less is known experimentally about ^{27}Si, but recent shell model calculations[5] predict the first $13/2^+$ state to be at 6.7 MeV, in good agreement with the strongest peak in the $^{26}Mg(p,\pi^-)$ spectrum. The situation is less clear at higher excitation energies, since several high-spin states are predicted in the neighborhood of the strong 9.5 MeV peak in the $^{26}Mg(p,\pi^-)$ spectrum. The ^{19}Ne(2.79 MeV) state, which is well-resolved in the $^{18}O(p,\pi^-)$ spectrum, is a known $9/2^+$ state.

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