ANALYZING-POWER MEASUREMENTS FOR $(\vec{p},n)$ REACTIONS

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Analyzing-power measurements were performed for the $^{48}Ca(p,n)^{48}Sc$ reaction at 134 MeV in about 6° steps from 0° to 60°. The overall neutron energy resolution varied from about 400 keV for angles less than 48° to about 750 keV at larger angles. Analyzing powers were extracted for several strong transitions observed in this reaction, including to members of the $(f_{7/2},f_{7/2}^{-1})$ particle-hole octet of states and to the 1^+, Gamow-Teller Giant Resonance (GTGR). Also, excitation-energy plots of the analyzing power were extracted at each angle.

The angular distributions of the analyzing power for the 0^+, 1^+, 3^+, and 7^+ members of the $(f_{7/2},f_{7/2}^{-1})$ band and for the 1^+ GTGR and 1^+, T=4 state at E_x = 16.8 MeV are shown in Figs. 1 and 2. Experimental results are shown compared to DWIA predictions for these transitions. The DWBA70[1] calculations used global optical-model parameters[2] and a popular nucleon-nucleon effective interaction.[3] The nuclear structure assumed for each state is from a 1f-2p shell-model calculation due to Brown.[4] The general shapes of these angular distributions are seen to change considerably from one transition to the next. It is significant that these general shapes are reproduced by these DWIA calculations. These results indicate that these "standard" calculations are relatively good for this reaction.

It is interesting to note that the experimental (and theoretical) shapes for the angular distributions of the 0^+, IAS and 1^+, 2.52 MeV states are similar; but that the shape for the 1^+, 16.8 MeV state is quite

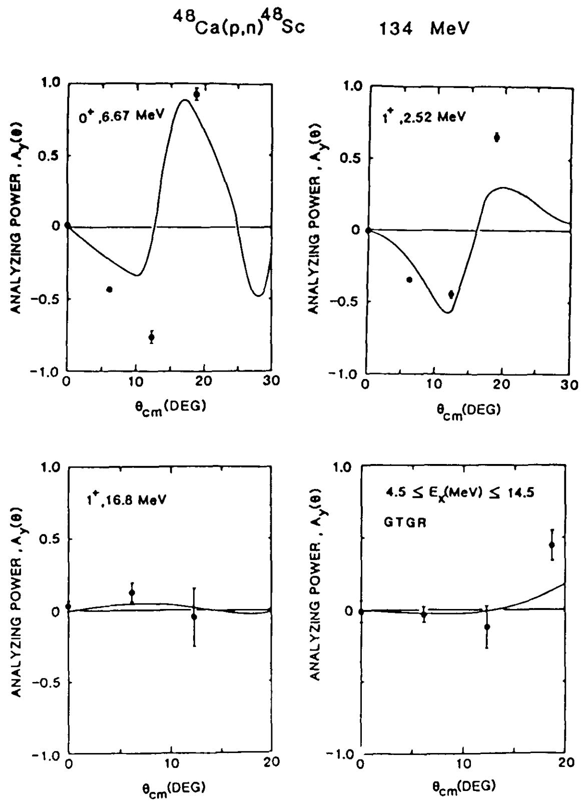

Figure 1. Analyzing-power angular distributions for some forward-peaked transitions in the $^{48}Ca(p,n)^{48}Sc$ reaction at 134 MeV.

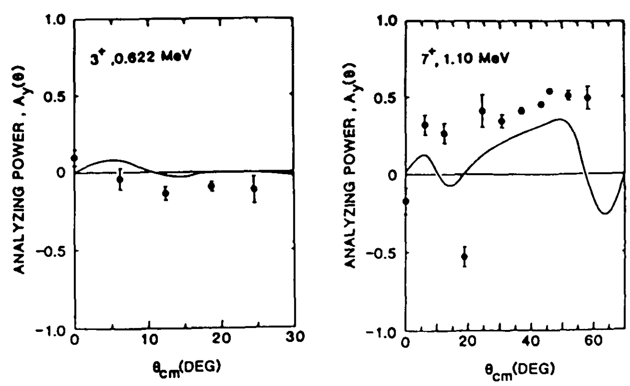

Figure 2. Analyzing-power angular distributions for two transitions to members of the $(f_{7/2},f_{7/2}^{-1})$ band in the $^{48}Ca(p,n)^{48}Sc$ reaction at 134 MeV.

different. The two 1^+ transitions both involve spin-transfer, while the 0^+ transition cannot. The low-lying 0^+, IAS and 1^+, 2.52 MeV states are expected to be predominantly $(f_{7/2},f_{7/2}^{-1})$, whereas the 1^+, 16.8 MeV state is expected to be predominantly $(f_{5/2},f_{7/2}^{-1})$. Hence, the observed shapes indicate that the analyzing power is more sensitive to the nuclear structure involved than to whether or not spin-transfer is involved.

1) J. Raynal and R. Schaeffer, computer code DWBA70.

2) P. Schwandt et al., Phys. Rev. C 26, 55 (1982).

3) W.G. Love and M.A. Franey, Phys. Rev. C 24, 1073 (1981).

4) B.A. Brown, Michigan State University, private communication.

THE 0^+ TO 0^- TRANSITION IN THE $^{16}O(p,n)^{16}F$ REACTION AT 80 MeV

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We measured the differential cross sections of the 0^-, 1^-, 2^- and 3^- states in ^{16}F from the $^{16}O(p,n)^{16}F$ reaction at an incident proton energy of 80 MeV. We achieved an energy resolution of 140 keV for 63 MeV neutrons with a flight path of 131 m and a Mylar $(C_{10}H_8O_4)$ target of 10.8 mg/cm^2. We measured time-of-flight spectra at 12 laboratory angles between 0 and 63 degrees (corresponding to momentum transfers from 0.22 to 1.93 fm^{-1}). Neutron detector arrays were installed in three detector stations at 0, 24 and 45 degrees with respect to the undeflected proton beam at distances of 131.0 m, 133.3 m and 131.1 m, respectively, from the target. The arrays consisted of NE-102 plastic scintillators 0.102 m thick with frontal areas of 1.55 m^2, 1.55 m^2 and 2.32 m^2, respectively. The performance of the large-volume, mean-timed, neutron detectors was reported previously.[1] Thin (0.953 and 1.27 cm thick) plastic scintillation counters were placed in front, behind, above and below the neutron detectors to veto cosmic rays. Between each neutron detector and the rear anticoincidence detector was material to stop recoil protons from neutron interactions in the rear of the neutron detector. Lexan, 3.8 cm thick, was used for this purpose in the 0 and 24 degree stations; 15 cm of plywood was used in the 45 degree station. In order to be able to