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FRAGMENTATION OF HIGH-SPIN PARTICLE-HOLE STATES IN ^{26}Mg

D.F. Geesaman and B. Zeidman
Argonne National Laboratory, Argonne, Illinois 60439

C. Olmer, A.D. Bacher, G.T. Emery, C.W. Glover, H. Nann, and W.P. Jones
Indiana University Cyclotron Facility, Bloomington, Indiana 47405

S.Y. van der Werf
Kernfysisch Versneller Instituut, Groningen, The Netherlands

R.E. Segel
Northwestern University, Evanston, Illinois 60204

R.A. Lindgren
University of Massachusetts, Amherst, Massachusetts 01003

Systematic information is now being obtained on the excitation of spin-flip degrees of freedom throughout the periodic table from inelastic scattering and charge exchange reactions. A systematic quenching of the isovector spin-flip strength has been identified,[1] though the quenching mechanism is not understood. Inelastic proton and pion scattering reactions also indicate a large quenching for isoscalar spin-flip excitations, but the systematics of this effect are less well-established.[2,3]

Several theoretical explanations have been offered for this reduction in the spin-flip strength. The explanations include: fragmentation of the single-particle strength,[4] mesonic renormalization of the spin current,[5] and the explicit inclusion of Δ(1232) isobar-hole states.[6] It appears that it may be possible to separate these mechanisms by studying the inelastic transition strengths as a function of single-particle occupation probability and as a function of angular momentum. The deformed nuclei in the s-d shell seem to be excellent candidates for such a study. The single particle occupation probabilities as determined by single nucleon transfer reactions change rapidly as the ground-state deformation changes. Also, several high-spin, 6^-, and low-spin, 1^+, states are known from previous work.[2,3,7]

We have measured the angular distributions and and analyzing powers for polarized proton scattering from ^{26}Mg at 135-MeV incident energy. Angular distributions were measured in 5° steps from a laboratory angle of 10° to 60° for states in the excitation energy range from 0 to 20 MeV. A typical spectrum is shown in Fig. 1. Based on the angular distributions of the cross sections and analyzing powers, five 6^- states at excitation energies of 9.18 ± 0.03 MeV, 11.98 ± 0.05 MeV, 12.48 ± 0.05 MeV, 12.85 ± 0.05 MeV and 18.0 ± 0.1 MeV have been identified. The 18-MeV level is believed to be a T=2, 6^- state.

Further analysis is in progress to improve the knowledge of the energy calibration.

DWIA calculations are being performed to extract the transition strengths for each state. Preliminary calculations indicate that the yield to the 6^-, T=2 level is ~45% of that expected for a pure $(d^{-3}_{5/2} f_{7/2})6^-, T=2$ state and that only ~20% of the expected summed strength to the T=1 levels is observed.

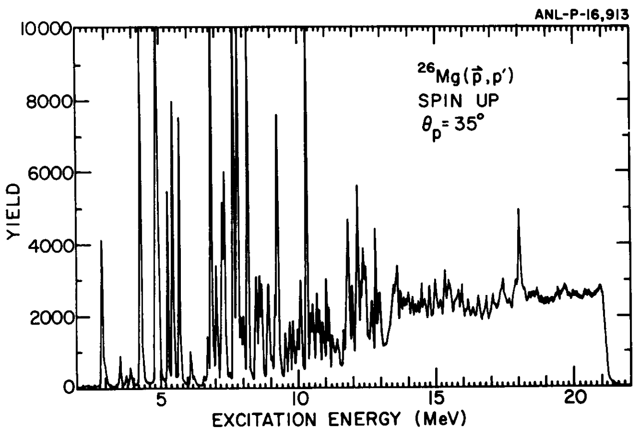

Figure 1. A proton spectrum at 35° resulting from the scattering of 135-MeV spin-up protons by ^{26}Mg. This spectrum is a composite of the data obtained with three momentum settings of the QDDM spectrometer.

With these data and the previously published data on ^{24}Mg and ^{28}Si,[2] we will be able to study the systematics of the quenching of the spin-flip strength under controlled changes in nuclear structure. This should provide important insight into the underlying quenching mechanism.

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HIGH-SPIN PARTICLE-HOLE STATES IN ^{116}Sn

S.Y. van der Werf
Kernfysisch Versneller Instituut, Groningen, The Netherlands
and
Indiana University Cyclotron Facility, Bloomington, Indiana 47405

A.D. Bacher, G.T. Emery, C.W. Glover, W.P. Jones, H.J. Karwowski, D.W. Miller, H. Nann, and C. Olmer
Indiana University Cyclotron Facility, Bloomington, Indiana 47405

Studies of the excitation of high-spin particle-hole states in medium-energy inelastic proton scattering have been extended to ^{116}Sn. It had been thought that this might be a favorable case for correlating (p,p') strength with that found in transfer reactions, since Groningen experiments[1] had shown strong excitation of a number of apparently high-spin states between E_x = 4 and 7 MeV in the reactions $^{113,115}In(\alpha,t)$, starting with the configuration $(g_{9/2})^{-1}$. In the experiment, however, carried out at E_p = 134 MeV with the QDDM spectrograph, it was found that no very strong correlation existed between excitation in (α,t) and in (p,p'). The 4-7 MeV region of excitation will require further detailed analysis.