Section III
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Neutron Hole State Structure in N=81 Nuclei. II

R.K. Jolly and E. Kaszy
Cyclotron Laboratory, Michigan State University
East Lansing, Michigan 48823

ABSTRACT

Angular distributions of neutrons from the (p,d) reaction (Energy Resolution 53 keV) on $^{114}$Sm and $^{114}$Mm at Ep=35 MeV have been measured and compared with Distorted Wave Born Approximation (DWBA) calculations. The DWBA calculations were performed both with and without the finite range and non-locality corrections. In some typical cases corrections were also included for the nuclear density dependence of the effective p-n interaction.

The DWBA cross sections for 1s states show an enhanced sensitivity to the inclusion of these corrections. Calculations including both the non-locality and finite range corrections yield acceptable spectroscopic factors. Considerable fractionation of the $(1g_{9/2})^2$ and the $(1g_{7/2})^2$ states is observed. No measurable population of neutron states in the 82-86 MeV major shell was observed. The neutron single hole energies (in MeV) are as follows: $d_{5/2}$ $-0.0$, $g_{7/2}$ $-0.45$, $h_{11/2}$ $-2.22$, $d_{5/2}$ $-1.52$, and $g_{7/2}$ $-2.12$ for $^{114}$Sm and $d_{5/2}$ $-0.0$, $g_{7/2}$ $-0.45$, $h_{11/2}$ $-1.07$, $d_{5/2}$ $-1.37$ and $g_{7/2}$ $-2.20$ for $^{114}$Mm.

Data on the systematics of splitting and movements of these single neutron hole states as a function of the proton number (Z) in $^{114}$Sm, $^{114}$Mm, $^{114}$Ce, and $^{114}$Ba shall be presented in a subsequent paper.

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ABSTRACT

Properties of positive-parity states of nuclei with $A=30-35$ have been calculated in a shell-model space which encompasses all Pauli-allowed basis vectors of all configurations $(O_6)^7(Op)^{12}$ $(O_6)^5((E_8)^3)^2(O_6)^{12}$ for which $n \geq 10$. Two different empirical Hamiltonians, one of a delta-function form, were used. Calculated energies and spectroscopic factors are in good agreement with an extensive body of experimental data. The model wave functions also yield satisfactory agreement with many available experimental data on electric quadrupole observables if effective charges of 0.5e are added to the proton and neutron. The model predictions for magnetic dipole observables are generally in qualitative agreement with experimental observations, but inconsistencies between theory and experiment are more noticeable in this area.

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Study of Charge-Exchange Coupling in Proton Induced Reactions on $^{10}$O, $^{11}$O and $^{12}$C

R.A. Hinrichs, G.W. Phillips, J.G. Cramer, and H. Wieman

Nuclear Physics Laboratory, University of Washington
Seattle, Washington 98105

ABSTRACT

The presence of isospin coupling in the incident channel has been studied via proton induced reactions on $^{10}$O, $^{11}$O and $^{12}$C. Anomalous behavior in the excitation functions at backward angles was observed in deuteron and proton outgoing channels. In the deuteron channels these anomalies, located near the $(p,n)$ threshold to the ground state analog were, for most cases, similarly characterized as a double dip in shape. Their strength is generally much weaker than the single minima observed in $(d,p)$ reactions near mass 90 and can be categorized by the proton decay energy from the analog state formed in the charge exchange process. The proton elastic excitation functions showed no structure near the $(p,n)$ thresholds although the $(p,p')$ curves did exhibit fluctuations.

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The Structure of Nuclei with Masses $A=30-35$, as Calculated in the Shell-Model

B.H. Widenenthal

Cyclotron Laboratory, Michigan State University
East Lansing, Michigan 48823

J.B. McFerron and E.C. Halbert
Oak Ridge National Laboratory, Oak Ridge, Tenn.

H.D. Graber
Cornell College, Mt. Vernon, Iowa 52314

Shapes of Angular Distributions in the $^{12}$C$(He, t)^{10}$O

Reaction to Antianalog and Other Tc States

R.A. Hinrichs and G.F. Trettelman

Cyclotron Laboratory, Michigan State University
East Lansing, Michigan 48823

ABSTRACT

The $^{12}$C$(He, t)^{10}$O reaction to Tc states in $^{10}$O shows the angular distributions to have shapes characteristic of non-allowed $L$ transfers and not similar to microscopic predictions. The antianalog states appear not to be unique in possessing this feature.

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The (p,t) Reaction on Even-Even $^{32}$Z Nuclei in the $^{2S}$d Shell

P.A. Paddock
Cyclotron Laboratory, Michigan State University
East Lansing, Michigan 48823

ABSTRACT

The (p,t) reaction on the even-even $^{32}$Z nuclei in the $^{2S}$d shell has been used to study the energy level of $^{1}$Ne, $^{23}$Mg, $^{27}$Si, $^{30}$P, $^{36}$Ar, and $^{40}$Ca. The energies of the excited states observed are reported along with spin and parity assignments when possible. Two nucleon transfer distorted wave calculations were carried out. Comparisons are made with the shapes of the experimental angular distributions. It is found that the calculated shapes are primarily dependent upon the L-transfer and the optical model parameters. The magnitudes of the calculated cross-sections are found to depend strongly not only on the optical model parameters, but also the bound state parameters and the configuration mixing in the initial and final nuclear wave functions.

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Preparation of Thin Film Deposits from Biological, Environmental and Other Matter

R.K. Jolly and M.B. White
Cyclotron Laboratory, Michigan State University
East Lansing, Michigan 48823

ABSTRACT

A technique for preparing uniform thin film deposits (10-1000 μg/cm²) of practically all materials of biological, environmental and nuclear physics interest is proposed. The technique involves preparing a solution or colloidal suspension of micron size particles of the substance of interest, generating a nebulized (practically invisible) mist from this liquid and condensing the mist on a rotating substrate. The cost in time and money for several materials is minimal.

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