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ASSOCIATION EURATOM - C.N.E.N.
(European Atomic Energy Community and
Comitato Nazionale per l'Energia Nucleare)

THE (n, d) PICK-UP REACTION ON $f_{\frac{7}{2}}$ PROTON SHELL NUCLEI

by

L. COLLI, E. GADIOLI, D. LUCIONI and S. MICHELETTI

1963

Work performed by Istituto Nazionale di Fisica - Nucleare (I.N.F.N.)
Sezione di Milano
under the Euratom contract No. 001-60-12 MPAI

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LEGAL NOTICE

The authors' names are listed in alphabetical order.

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The angular distribution of deuterons from the reaction $Fe^{56}(n,d)Mn^{55}$ has been measured for the $l = 3$ transition to the ground state of Mn^{55}. A good fit is found with DWBA calculations. A satisfactory agreement is also obtained between the experimental values of the cross section for the transition to the ground state of the final nucleus in a series of isotopes belonging to the $f_{\frac{7}{2}}$ proton shell and the theoretical values obtained from the shell model in the *j-j* coupling limit by means of DWBA calculations.

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THE (n,d) PICK-UP REACTION ON $f_{\frac{7}{2}}$ PROTON SHELL NUCLEI

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Abstract: The angular distribution of deuterons from the reaction $Fe^{56}(n,d)Mn^{55}$ has been measured for the $l=3$ transition to the ground state of Mn^{55}. A good fit is found with DWBA calculations. A satisfactory agreement is also obtained between the experimental values of the cross section for the transition to the ground state of the final nucleus in a series of isotopes belonging to the $f_{\frac{7}{2}}$ proton shell and the theoretical values obtained from the shell model in the *j-j* coupling limit by means of DWBA calculations.

1. Introduction

The absolute values of the cross-section, together with the angular distributions of the particles emitted, are the most important experimental data needed to understand a reaction mechanism from a comparison with the theory and eventually to determine the nuclear parameters involved. In a previous group of experiments[1-2]), we have studied the (n,d) reaction on the nuclei between Sc^{45} and Ni^{60}. The intensity of the transition leading to the ground state of the residual nucleus has been measured for these nuclei at an average laboratory scattering angle of 15°. In order to obtain more complete data on these reactions, we have successively undertaken the measurement of the angular distribution of the emitted deuterons in the cases of Fe^{54} and of Fe^{56}; we report on the latter in this paper. We have compared the complete group of results with the predictions given by the DWBA theory as calculated by Satchler[3]), finding that it gives a rather good description of the reaction mechanism.

2. Experimental Apparatus and Results

The measurement of the angular distribution of deuterons from the reaction $Fe^{56}(n,d)Mn^{55}$ has been made with the apparatus described in the preceeding papers[1,2]). Neutrons of 14 MeV energy, obtained by the reaction D + T are used to bombard the target of the Fe^{56} isotope, and the emitted deuterons are counted and analysed in energy by means of a telescope of proportional and scintillation counters. Other charged particles than the deuterons are excluded by means of the usual energy-energy loss technique.

The peak of deuterons corresponding to the transition to the ground state of the

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‡ Work done under the research Contract Euratom-CNEN.