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THE (n, d) PICK-UP REACTION
ON $f_{7/2}$ 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
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the $j-j$ coupling limit by means of DWBA calculations.

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

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Received 18 December 1962

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 $f_{7/2}$ 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 experiments¹⁻²), 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 Satchler³), 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 preceding 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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