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Vector Analyzing Power for Two-Step Process in the Reaction $^{12}C(d, {}^6Li){}^8Be$*

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Vector analyzing powers and differential cross sections via direct process in the reaction (d, ^{6}Li) show a distinctive angle dependence for an individual angular momentum transfer[1]. For two-step process, it is expected that the angular distribution of the analyzing powers shows dependence of the l-s coupling of the intermediate states in the (d, ^{6}Li) reaction.

The isobaric doublet states of $J^\pi = 2^+$ at 16.6 and 16.9 MeV located near proton threshold in ^{8}Be were strongly excited in the present experiment. Marion[2] has already proposed a cluster model description of the 16.6 and the 16.9 MeV states, wherein the suggested configurations are (p+^{7}Li) and (n+^{7}Be), respectively. The differential cross sections and the analyzing powers of ^{6}Li to the 16.6+16.9 MeV state are compared with the results of the DWBA calculations in Fig. 1. The dashed curves indicate the results of the calculation for a direct α-pickup process. At small angles $\theta_{cm} < 30°$, the dashed curves well reproduce the data of both the differential cross sections and analyzing powers but there are large discrepancies between the data and the calculation curves at angles larger than 30°. Two-step process calculations were done for the 16.6+16.9 MeV state using the finite-range DWBA-code[3]. A (d-^{7}Li-^{6}Li) and a (d-^{7}Be-^{6}Li) process were taken into consideration in the two-step calculations. A flowchart of these two-step processes is shown in Fig. 2. As intermediate states of ^{7}Li or ^{7}Be, the $3/2^-$ ground state and the first excited $1/2^-$ state are considered. These states have the same orbital angular momentum and each spin couples with the orbital angular momentum in an opposite direction. Then, it is expected that the angular distribution of the analyzing powers exhibit the dependence on the l-s coupling of intermediate states for two-step process. The results of the two-step process calculations are indicated by solid curves in comparison of the experimental data in Fig. 1. An amplitude of each process used in the coherent summation for the differential cross sections and

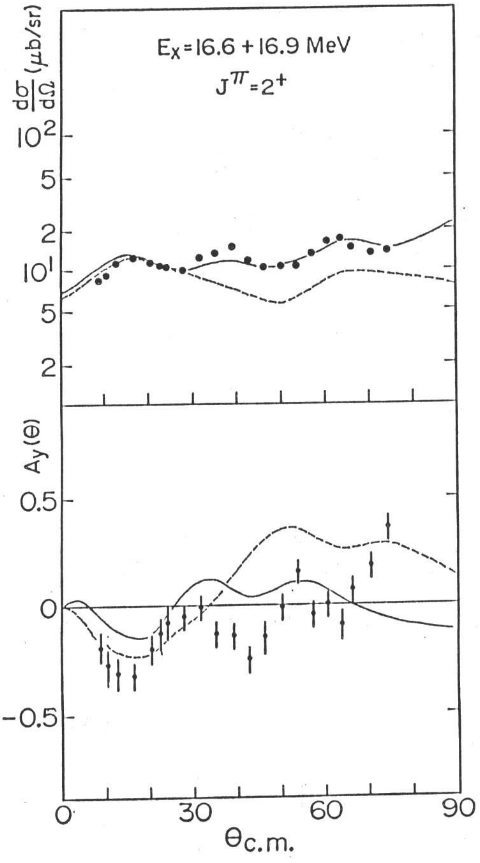

Fig. 1. Cross sections and analyzing powers for sum of the 16.6 MeV + 16.9 MeV ($J^\pi = 2^+$, T = 0, 1) state.

the analyzing powers in listed in Table I. On the basis of these results, it is shown that the first excited $1/2^-$ state of ^7Li or ^7Be, as the intermediate states in the two-step processes, plays a major role in the vector analyzing powers.

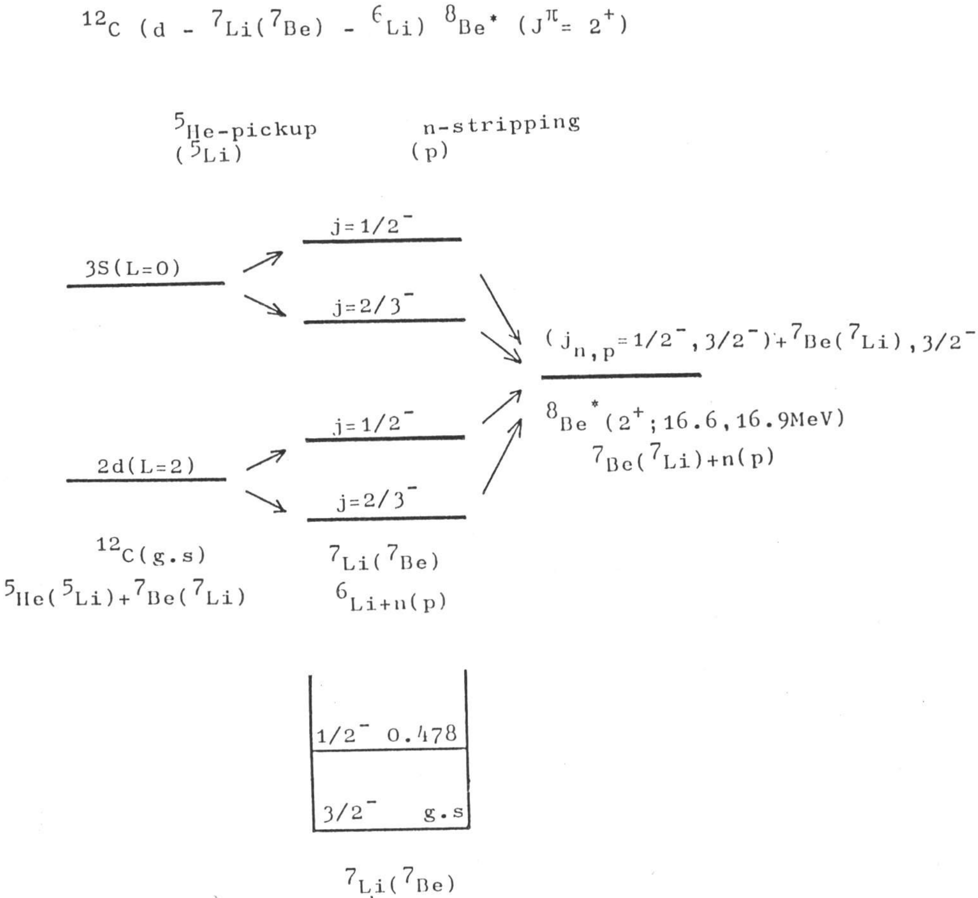

Fig. 2. Flowchart of reaction processes.

Table I

	$^{12}C \to {}^5He+{}^7Be$	$^7Li(j_n)$ or $^7Be(j_p)$	$^8Be^*(j_n)$	Amplitudes
direct				0.05
two-step	3S(L=0)	$1/2^-$	$3/2^-$	1.0
	2d(L=2)	$1/2^-$	$3/2^-$	-0.05

References

1) T. Yamaya et al., contribution to this conference.
2) J.B. Marion, Phys. Lett. 14 (1965) 315.
3) M. Igarashi, Finite range DWBA code TWOFNR: private communication, 1977.