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1.89 Vector Analyzing Power of Polarized Deuterons in the ($\vec{d}$, ^{6}Li) Reaction

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Vector analyzing powers and differential cross sections in the reaction ^{12}C, ^{16}O($\vec{d}$, ^{6}Li) have been measured for the ground states and the excited states of ^{8}Be and ^{12}C. The vector polarized deuteron beam of E_d = 51.7 MeV was provided from the RCNP AVF-cyclotron. The experimental data were analyzed using the finite-range DWBA-code TWOFNR[1]. The deuteron and ^{6}Li optical model parameters used in the DWBA calculation were obtain from the analyses of elastic scattering of 52 MeV deuterons by Hinterberger et al.[2] and elastic scattering of 50.6 MeV ^{6}Li by Chua et al.[3], respectively. The optical potential parameters used are listed in Table I. The α-spectroscopic factors for the members of ground state band of ^{8}Be and ^{12}C were extracted from the comparison between the present data and the DWBA calculations, and these spectroscopic factors are in agreement with the theoretical predictions by Kurath[4].

The differential cross sections and the vector analyzing powers for the ground states of ^{8}Be and ^{12}C are shown in Fig. 1 together with the results of the finite-range DWBA calculations. The solid curves are the results obtained from the optical potential parameters listed in Table I. The dotted curves show the results of the calculations with V_{so} (^{6}Li) = 0. As indicated by the dotted curves, effect of the spin-orbit term of the ^{6}Li optical potential are small in the analyzing powers, when compared with an effect of deuteron spin-orbit potential. This fact can be explained in framework of the DWBA analysis taking into account a strong absorption effect of ^{6}Li on a nuclear surface. The ^{6}Li spin-orbit coupling potential was derived, using a single folding method proposed by Thompson[5] and by Amakawa[6] et al., from the deuteron spin-orbit potential used in the present DWBA calculations. However, these spin-orbit potential was too small for fitting the present data.

Vector analyzing powers of polarized deuterons elastically scattered from ^{12}C and ^{16}O at E_d = 52 MeV[7] are also shown in a bottom of the Fig. 1. The dashed curves show the results of the DWBA calculations for deuteron elastic scattering using the deuteron optical potential listed in Table I. The solid curves indicated the calculated analyzing powers for the reaction ($\vec{d}$, ^{6}Li). Angular dependence of the analyzing pow-

Table I. Deuteron and Lithium optical model parameters used.

	V_R (MeV)	r_R (fm)	A_R (fm)	W_I^S (MeV)	W_I^V (MeV)	r_I (fm)	a_I (fm)	V_{so} (MeV)	r_{so} (fm)	a_{so} (fm)
Deuteron										
^{12}C	83.1	1.05	0.80	13.0	—	1.22	0.75	7	0.5	0.80
^{16}O	85.0	1.2	1.0	9.3	—	1.28	0.75	6	0.8	1.1
^{6}Li										
^{8}Be	190.0	1.085	0.55	9.0	—	2.2	2.0	2.5	1.01	0.935
^{12}C	200.0	1.3	0.7	—	26.8	1.7	1.2	2.5	1.01	0.935

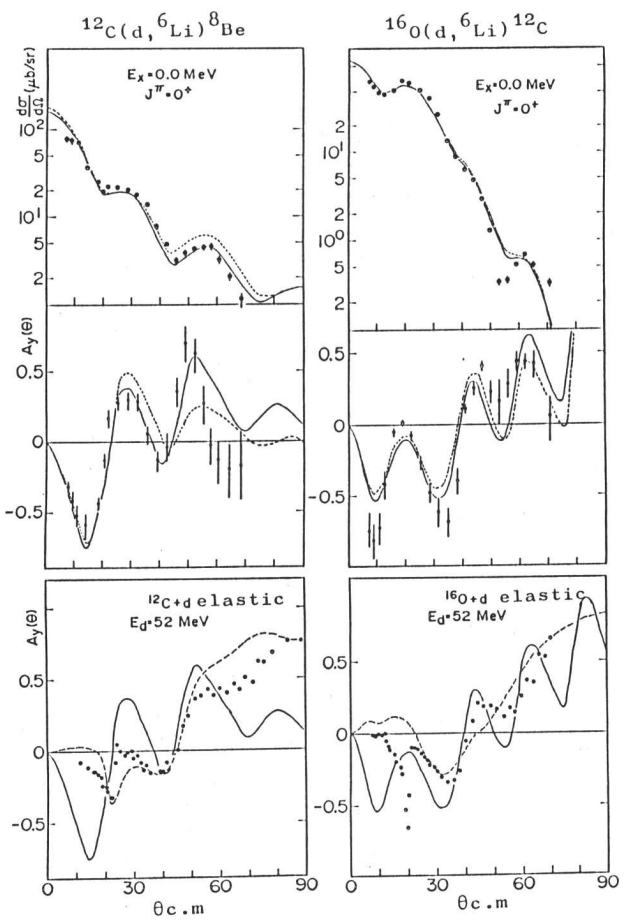

Fig. 1. Cross sections and analyzing powers in the ^{12}C, $^{16}O(d, ^{6}Li)$ reaction for the ground states. The curves are the results of finite-range DWBA calculations. Bottoms of Fig. 1 shows analyzing powers for the elastic scattering of 52 MeV deuterons by Mairle et al.[7]

ers in the reaction $(\vec{d}, ^{6}Li)$ are similar to the elastic scattering data except for those at small angles $\theta_{cm} \leq 15°$. The analyzing powers at these small angles strongly depend on a transferred angular momentum L_α. For instance, the $L_\alpha = 0$ transitions to the ground states of ^{8}Be and ^{12}C posses large negative values of analyzing powers at small angles. The $L_\alpha = 2$ transition to the 2^+ states, however, has positive analyzing powers at small angles. In the (d, ^{6}Li) reaction, the analyzing powers for the elastic scattering of deuterons strongly reflect in the reaction analyzing powers. The ^{6}Li spin-orbit coupling potential derived from deuteron spin-orbit potential using the single folding method is too small in this reaction.

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