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1.102 Analysing powers of (^{3}He,^{7}Be) and (^{3}He,^{6}Li) reactions on ^{12}C

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The analysing powers and differential cross sections for the ^{12}C(^{3}He,^{7}Be)^{8}Be and ^{12}C(^{3}He,^{6}Li)^{9}B reactions have been measured with the 33.4 MeV polarised ^{3}He beam on the University of Birmingham Radial Ridge cyclotron. Surface barrier silicon detector telescopes were used, with ΔE detectors between 19–32 microns thick, and the mass separation was achieved with the Birmingham analog particle identifiers.

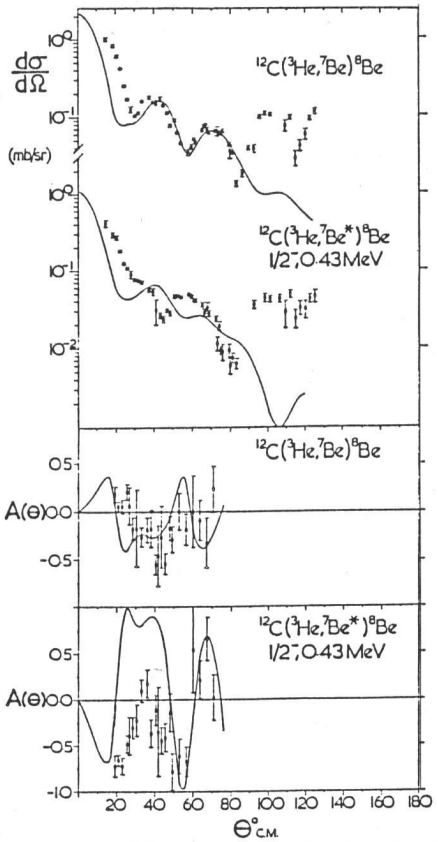

Fig.1 Differential cross sections and analysing powers for the reaction ^{12}C(^{3}He,^{7}Be)^{8}Be to the ground state ($3/2^-$) and the $1/2^-$, 0.43 MeV first excited state of ^{7}Be. The curves show preliminary DWBA predictions obtained with the code FRUCK2.

For the ^{12}C(^{3}He,^{7}Be)^{8}Be reaction analysing powers were obtained for transitions to the ^{8}Be$_{g.s.}$ for the ground state and the first exicted state of ^{7}Be and the results are shown in Fig.1. Previous investigations[1,2,3] of this reaction have noted a strong energy dependence of the cross sections between 25 and 40 MeV for the two transitions studied in the present work. Radiochemical methods[4] have shown that the bulk of the total reaction cross section occurs via compound nuclear processes for ^{7}Be ejectiles of less than 4 MeV. Results for the ^{12}C(^{3}He, ^{6}Li)^{9}B reaction are shown in Fig.2. The forward peaked and oscillatory nature of the distributions

observed in the present work suggest that they are due to a direct reaction process. Indeed, Hauser-Feshbach calculations have shown the compound nuclear contribution to be lower by an order of magnitude at small angles. Unfortunately, DWBA analysis of the reaction has been hampered by the absence of experimentally determined ^{7}Be optical model parameters.

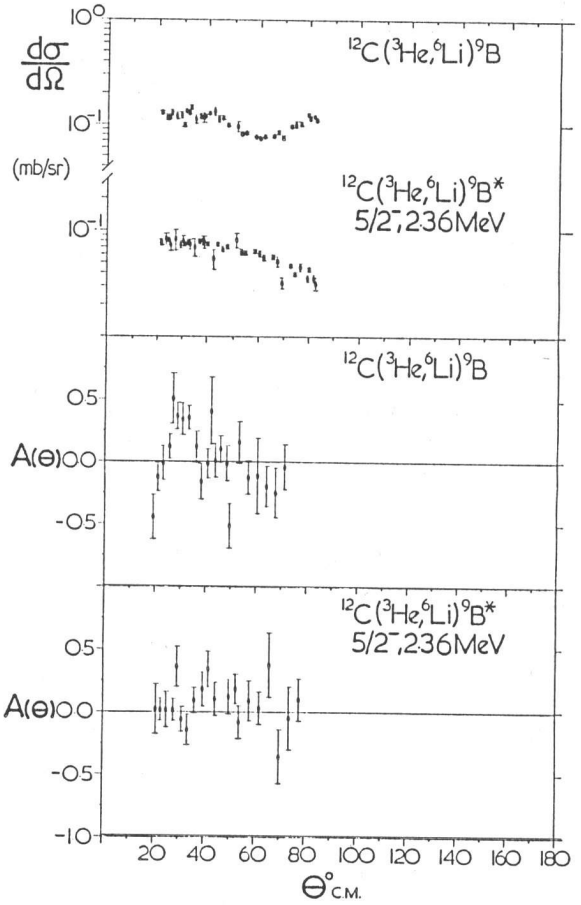

Fig.2 Differential cross sections and analysing powers for the reaction ^{12}C(^{3}He,^{6}Li)^{9}B leading to the ground state ($3/2^{-}$) and the $5/2^{-}$ 2.36 MeV excited state of ^{9}B.

In a preliminary DWBA analysis of the results using the code FRUCK2 the 41 MeV parameters of ref.3 were found more satisfactory than the ^{6}Li parameters obtained from scattering data at the correct energy. The calculations shown in Fig.1 have also used the bound state parameters of ref.3, and the entrance channel potential from ref.5.

Further analysis is intended to proceed by generating folded energy dependent ^{7}Be potential and attempt to reproduce the observed energy dependence of the cross sections and to use the analysing powers to examine the possibility of channel coupling effects, in particular to the first 2^{+} state of ^{12}C.

References

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