# A STUDY OF THE $^{24}Mg(^{6}Li,t)^{27}Si$ REACTION AT 75 MEV

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Three nucleon transfer reactions induced by $^{6}Li$ ions on light nuclei[1-4] have shown that these reactions are very selective and tend to favor the population of high-spin states. These studies, carried out at bombarding energies between 24 and 36 MeV, suffered from one major complication: the relative strength of the highest-spin member of a particular configuration was suppressed due to barrier inhibition. At higher bombarding energies this deficiency is expected to be remedied and the relative transition strengths should resemble that of the geometrical coefficients for three-nucleon transfer.

We have studied the $^{24}Mg(^{6}Li,t)^{27}Si$ reaction at 75 MeV bombarding energy. The target nucleus $^{24}Mg$ was chosen to shed some additional light on the nature of some high spin states in $^{27}Si$. Recent studies of the $^{28}Si(p,d)^{27}Si$ reaction at high momentum transfer carried out at IUCF ($E_p$=135 MeV)[5] and at LAMPF ($E_p$=800 MeV)[6] show that four previously unknown states in $^{27}Si$ at 7.12, 8.37, 9.62 and 11.65 MeV of excitation are strongly populated. It has been surmised that these states are high-spin states excited in two-step processes with the first step being inelastic scattering to the known $(d_{5/2}^{-1},f_{7/2})_{T=0}$ one-particle, one-hole states at 6.88, 8.41, 9.70 and 11.58 MeV in $^{28}Si$ and the second step being the pickup of a $1d_{5/2}$ neutron. If this conjecture is right, these states should also be strongly excited in the $^{24}Mg(^{6}Li,t)^{27}Si$ reaction.

The $^{24}Mg(^{6}Li,t)^{27}Si$ reaction was studied at 75 MeV bombarding energy using the QDDM magnetic spectrometer to obtain adequate energy resolution. In order to cover the excitation energy region between 6 and 15 MeV, three different magnetic field settings were required. Figure 1 shows a composite spectrum from these different bites. Only states at 6.34, 8.37, 11.34 and 11.65 MeV are strongly excited. The corresponding angular distributions are displayed in Fig. 2. No discernible patterns between the different angular distributions can be extracted.

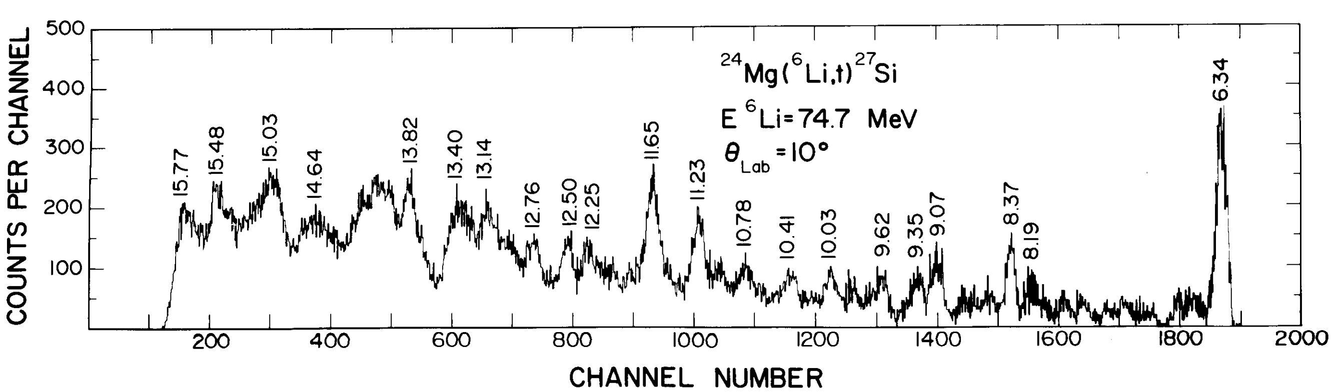


Figure 1. Composite spectrum of the $^{24}Mg(^{6}Li,t)^{27}Si$ reaction.

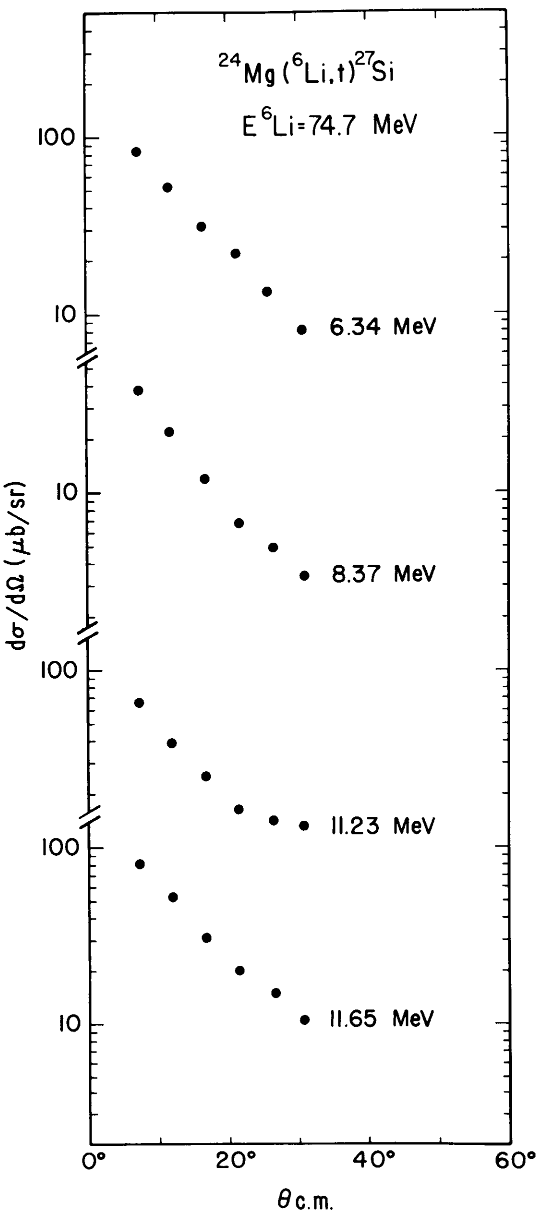


Figure 2. Angular distributions for the states strongly populated in the $^{24}Mg(^6Li,t)^{27}Si$ reaction.

A comparison of the present $^{24}Mg(^6Li,t)^{27}Si$ results to those from the $^{28}Si(p,d)^{27}Si$ reaction shows that the 8.37 and 11.65 MeV states are strongly excited in both reactions, whereas the 7.12 and 9.62 MeV states are only strong in the $^{28}Si(p,d)^{27}Si$ reaction. This indicates that the aforementioned conjecture of exciting these few states in the $^{28}Si(p,d)^{27}Si$ reaction might be wrong.

A DWBA analysis of the $^{24}Mg(^6Li,t)^{27}Si$ differential cross sections is in progress.


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