Incident-Energy Dependence of the Analyzing Power in the ^{58}Ni(p,^{3}He)^{56}Co Reaction between 80 and 120 MeV

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We investigate the possible incident energy dependence of the analising power in the reaction ^{58}Ni(p,^{3}He)^{56}Co. This effect has been observed in previous studies where light clusters are emitted during the interaction of medium energy protons. These earlier inclusive reactions, described in terms of a statistical multi-step formalism, showed that in general the higher order steps begin to dominate at increasing incident energies. The analysing power poses to be quite a sensitive observable to identify the contributions of the different order steps. Large analysing power values, indicative of single-step direct reactions, was observed for the small scattering angles and low excitation of the residual nucleus.

Also consistent with this multi-step theory, is a decrease in the analysing power as the incident energy of the projectile is increased. However, a slight decrease in the analysing power was also observed for low excitations which contradicts the understanding that low excitation would imply a direct reaction mechanism with large analysing power values. Possible reasons for this phenomenon could include the effect of the incident energy dependence of the direct reaction competing with higher order steps of the multi-step mechanism or the combined effect of different discrete states. To better understand this discrepancy the excitation to low lying states in the residual nucleus has been investigated.

We present experimental cross section and analysing power data for three incident energies and the results of macroscopic Distorted Wave Born Approximation (DWBA) calculations for a few discrete states of ^{56}Co assuming a one-step deuteron pickup mechanism.