

TARGET MASS DEPENDENCE OF THE AVERAGE LINEAR MOMENTUM TRANSFER

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The systematics of linear momentum transfer in nuclear reactions for heavy¹ and medium mass² ($A \approx 60$) targets seem to indicate a rather strong target dependence of the average transferred momentum. This target dependence is also predicted in recent calculations.^{3,4} However, the experimental data for heavy and medium mass nuclei are gathered by different experimental methods (fission fragment angular correlations and recoil range measurements, respectively) and a systematic difference between these methods cannot be ruled out a priori. Therefore it seemed useful to investigate the average momentum transfer for heavier mass targets by the recoil range method.⁵

In this contribution we present the preliminary results of measurements of the average linear momentum transfer in the ${}^4\text{He} + \text{natAg}$ reaction and we compare them with previously gathered⁵ results for the ${}^4\text{He} + {}^{59}\text{Co}$ reaction.

The average transferred linear momentum, cross section weighted, is obtained through measurement of the recoil ranges of the radioactive reaction products. The recoil velocities are deduced using range-energy tables. It is assumed that the radioactive reaction products constitute a representative sample of heavy reaction residues and that the average linear momentum transfer computed for this sample is close to the average for the whole population.

Figure 1 shows the average transferred linear momentum for ${}^4\text{He} + \text{natAg}$ and for ${}^4\text{He} + {}^{59}\text{Co}$ reactions. A clear target mass dependence of this quantity is observed.

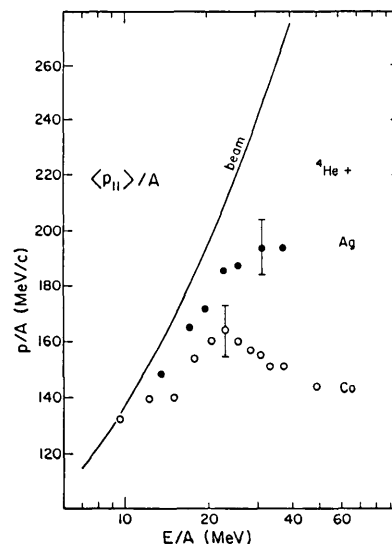


Figure 1. Average transferred linear momentum divided by A , the mass of the projectile, as a function of the bombarding energy divided by A for the ${}^4\text{He} + \text{natAg}$ and ${}^4\text{He} + {}^{59}\text{Co}$ reactions. The ${}^{59}\text{Co}$ data are from Ref. 5.

In our previous work on ${}^4\text{He} + {}^{59}\text{Co}$ we claimed a reaction mechanism change at about $23/A$ MeV bombarding energy as indicated by a distinct change in the momentum transfer pattern. Although for ${}^4\text{He} + \text{Ag}$ reaction the average momentum transfer still increases above this energy, the increase is much slower than for lower energies. This may indicate the persistence of the reaction mechanism change for ${}^4\text{He}$ projectiles at this energy for targets heavier than $A \approx 60$.

- 1) K. Kwiatkowski et al. Proc. of the III Workshop on Nuclear Dynamics, Copper Mountain, Colorado 1984.
- 2) T. Batsch et al., Proc. of the 4th International Conference on Nuclear Reaction Mechanism, Varenna, 1985.
- 3) C. Gregoire and F. Scheuter, Phys. Lett. **146B**, 21 (1984).
- 4) J. Aichelin, preprint.
- 5) J. Jastrzebski et al., Phys. Lett. **136B**, 153 (1984).