

SEARCH FOR FISSION-LIKE PROCESSES IN THE 200-MeV $p + {}^{28}\text{Si}$ REACTION

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Studies of the 200-MeV $p + {}^{28}\text{Si}$ reaction at backward angles show evidence of significant amounts of relatively energetic ions of $Z > 9$. In order to examine the possibility that these yields may be the result of a two-body breakup (fission-like) process, a coincidence experiment was performed.

A 100 $\mu\text{g}/\text{cm}^2$ isotopically-separated target of ${}^{28}\text{Si}$ was bombarded with 200-MeV protons from the Indiana University Cyclotron Facility. The fragments were detected with a pair of gas-ionization- ΔE and semiconductor-E detector telescopes operating at gas pressures of 6 and 9 torr of isobutane. Windows on the gas ionization detectors were 70 $\mu\text{g}/\text{cm}^2$ polypropylene. Fragments with atomic numbers up to $Z=12$ with energies as low as ~ 0.2 MeV/nucleon could be detected with this system. One detector telescope served as a defining detector ($\Delta\theta = \pm 2$ degrees) and was kept fixed at forward laboratory angles (11, 30, and 55 deg.) while the second detector ($\Delta\theta = \pm 4$ degrees) was rotated through correlation angles, θ_{AB} , from approximately 40 to 180 degrees in the laboratory system. Both singles and coincidence data were recorded on line.

In Fig. 1 is shown an example of data taken at 11° by the defining detector. In this ΔE versus E contour taken at a gas pressure of ~ 9 torr, Z values of up to $Z=12$ are clearly defined. Because of their low energy loss in the gas-ionization detector, $Z=1$ and $Z=2$ are not clearly defined in these spectra. In Fig. 2, taken at 170° and 9 torr, fragments with charges up to $Z=9$ are clearly observed, indicating that some heavy fragments are being emitted in the backward direction. However, the coincidence spectra indicate few heavy fragment-heavy fragment coincidences. Instead the

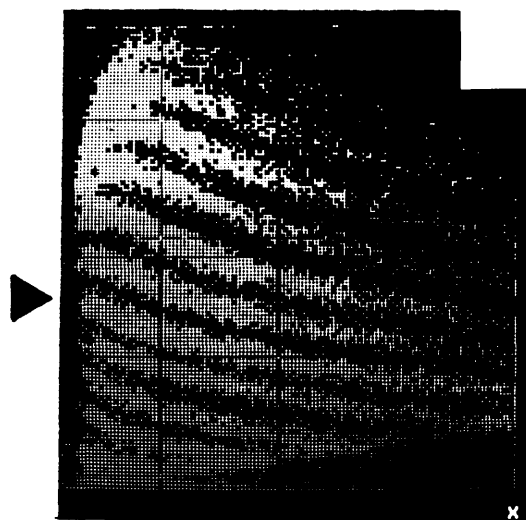


Figure 1. Charge identification spectrum ΔE versus E contours of fragments from $p+{}^{28}\text{Si}$ at 200 MeV for 11° and 9 torr. $Z=6$ is indicated by arrow.

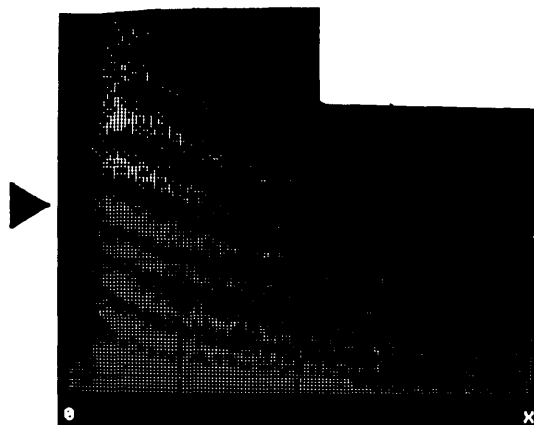


Figure 2. Charge identification spectrum ΔE versus E contours of fragments from $p+{}^{28}\text{Si}$ at 200 MeV for 170° and 9 torr. $Z=6$ is indicated.

heavy fragments are found to be primarily in coincidence with H or He. Further work and analysis are in progress in order to understand the yields and sources of these energetic fragments emitted at backwards angles.