THE $(p,\pi^{\pm})$ REACTIONS ON $^{12,13}C$ AT 200 MeV

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Angular distributions from the (p,π^+) and (p,π^-) reactions on ^{12}C and ^{13}C leading to several discrete states in the residual nuclei have been measured at 200 MeV bombarding energy. The experiment was performed using the QDDM spectrograph.

The differential cross sections for the transitions to the ground state of the residual nucleus are plotted in Fig. 1 versus the center-of-mass momentum transfer q. The striking feature of these data is that the ratio of the (p,π^+) to (p,π^-) cross sections is much larger for ^{12}C than for ^{13}C. The relatively small (p,π^-) cross section for ^{12}C cannot be explained by the differences in spins and Q-values, but can be understood qualitatively in terms of a two-step reaction process in which π^0 emission from the incident proton is followed by pion charge exchange (π^0,π^-) on a bound neutron. When ^{13}C is the target nucleus, the pion charge exchange can occur on the valence neutron, which becomes a proton occupying the same $1p_{1/2}$ subshell. For ^{12}C, the charge exchange occurs mainly on a core neutron, which must be excited to the $1p_{1/2}$ shell. The (p,π^-) production on ^{12}C thus involves a rearrangement of the target nucleus which is not necessary for ^{13}C. This might explain the suppression of the (p,π^-) cross section on ^{12}C.

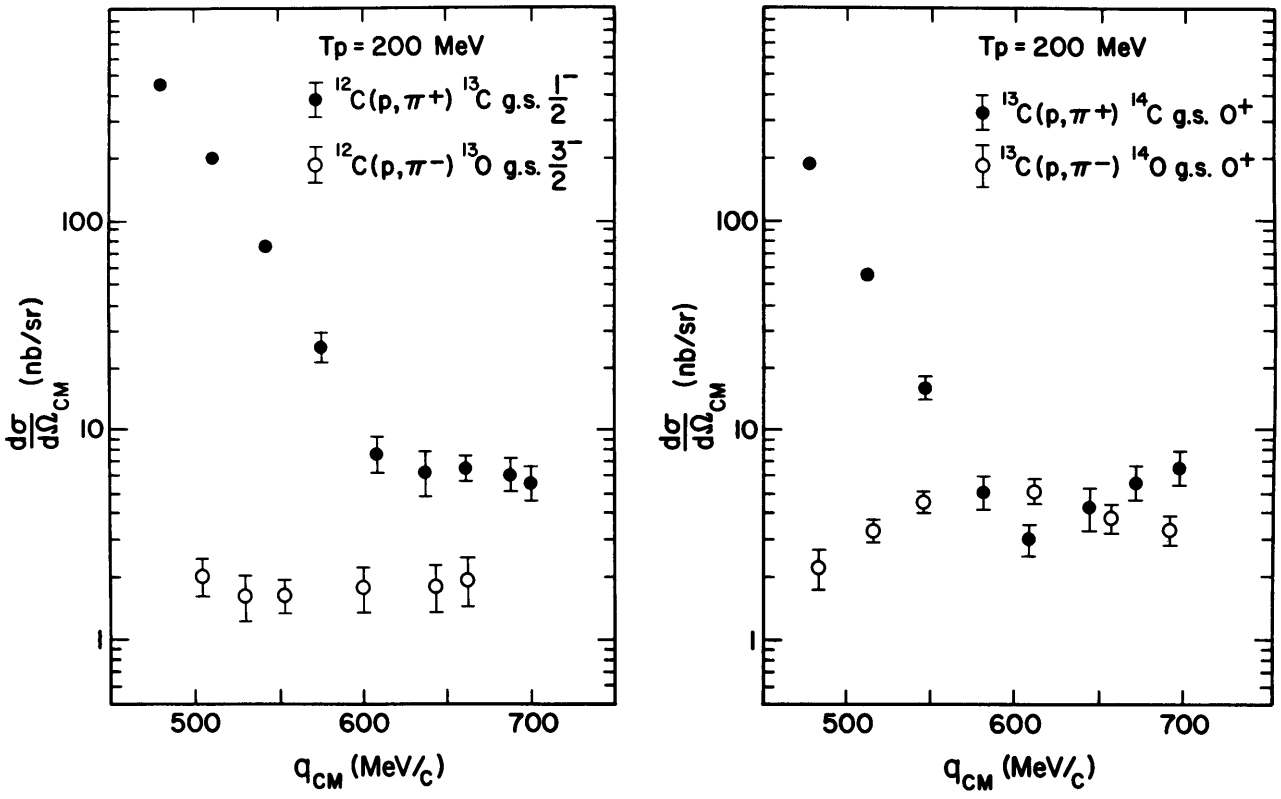

Figure 1. Differential cross sections vs momentum transfer for the (p,π^+) and (p,π^-) reactions on ^{12}C and ^{13}C.