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COMPARISON OF THE $^3\text{He}(p,2p)d$ AND $^3\text{He}(p,pd)p$ REACTIONS*

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In the present experiment the $^3\text{He}(p,2p)d$ reaction was measured at 300 MeV at the angle pair 70° - 33° and at 450 MeV at the angle pairs 70° - 30° and 46° - 46° for recoil momenta larger than 350 MeV/c. For the $^3\text{He}(p,pd)p$ reaction energy sharing loci were measured at 450 MeV for the angle pairs 25° - 68° and 50° - 68° yielding a recoil momentum range from 0 to 480 MeV/c. In the framework of the PWIA the proton-deuteron relative motion momentum distributions extracted from $^3\text{He}(p,2p)d$ and $^3\text{He}(p,pd)p$ should be identical. A comparison of the two reactions is therefore a useful tool to investigate the presence of competing processes such as multiple scattering, final state interaction and isobar configuration effects.

1. EXPERIMENTAL PROCEDURE

The experiment was performed using proton beams from the TRIUMF accelerator incident on a liquid ^3He target of thickness 104 mg/cm^2 . The detection apparatus used provided energy, angular position, timing and particle identification information.

In the case of the $^3\text{He}(p,2p)d$ measurements, the two-body breakup of ^3He in the final state was separated from three-body break-up by detecting, in addition to the two protons, the recoil deuteron in coincidence. The momentum of one of the emitted protons was measured by the magnetic spectrometer (MRS); the energies of the second emitted proton and the recoil deuteron were measured by range counter telescopes containing a 12.7 cm diameter by 15.2 cm thick NaI(Tl) detector. In the case of the $^3\text{He}(p,pd)p$ measurements the scattered protons were detected with a range counter telescope while the ejected deuterons were

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detected with the magnetic spectrometer.

2. RESULTS AND DISCUSSION

The experimental momentum distribution times the spectroscopic factor is plotted in Figure 1. In Figure 2, in addition to the data of the present experiment, 590 MeV ${}^3\text{He}(p, pd)d$ data¹ and 530 MeV ${}^3\text{He}(e, e'p)d$ data² are shown. The three curves are the spectral functions $S(k, E)$ obtained by Ciofi degli Atti et al.³ (curve 1), Dieperink et al.⁴ (curve 2) and Meier-Hajduk et al.⁵ (curve 3). At large momenta the $(p, 2p)$ and (p, pd) results disagree with the calculated spectral functions and with the $(e, e'p)$ results. However, it is to be noted that the ${}^3\text{He}(p, 2p)d$ and ${}^3\text{He}(p, pd)p$ results agree with each other, which one would not expect to occur in the case of strong distortions.

FIGURE 1
Experimental results compared with a
PWIA prediction (see text).

FIGURE 2
Experimental results compared with
various spectral functions.

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