A Three-Body Faddeev Calculation of the Double Polarized ^{3}He(d,p)^{4}He Reaction in the Super Low-Energy Region

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On the double-polarized d-^{3}He reaction, the existence of two sharp resonance states ($5/2^+$, $3/2^+$) and one broad resonance state ($1/2^+$) above the d-^{3}He threshold in the region from 300keV to 400keV was presented in our previous calculation. Although, the total cross section and the resonance width were fairly differ from the experimental data. It was done by using the three-body Faddeev calculation for the n-p-^{3}He system with the rank-1 NN and also a rank-1 Pauli corrected N-^{3}He potentials.

Recently, it is found that the off-shell behavior of the p-^{3}He and n-^{3}He potentials is very important to represent such a physical observable. In our present work, we adopt the rank-3 $^1S_0$ and $^3S_1$ partial waves for Pauli corrected n-^{3}He, p-^{3}He potentials and the rank-1 NN-potential for the $^1S_0$, $^3S_1$-$^3D_1$, $^1P_1$, $^3P_0$, $^3P_1$, $^3P_2$-$^3F_2$, $^1D_2$, and $^3D_2$ states. The calculation shows only one broad resonance state ($3/2^+$) which is comparable with the experimental data (Fig.1). Furthermore, it was confirmed that the effect of the double-polarized reaction brings the total cross section enhancement as well as the former calculation. The complete calculation will be expected by including the full off shell effects in the realistic interactions.

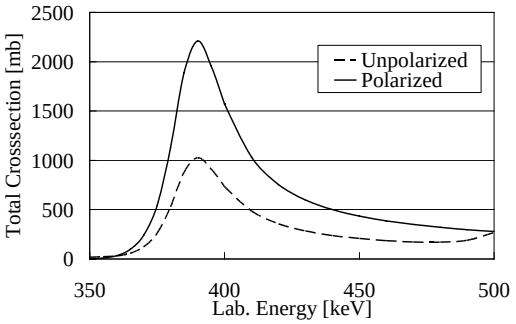

FIGURE 1. The total cross section enhancement of the double polarized ^{3}He(d,p)^{4}He reaction. The enhancement is almost twice of the un-polarized one around 400keV region for the resonance state ($3/2^+$). The absolute value is still larger than the experimental value and the width is smaller than that. Rank-3 NN potentials should be adopted as well as N-^{3}He potentials.

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