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Multiple mechanisms in proton-induced one nucleon removal from ^{14}O at $\sim$100 MeV/nucleon

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One nucleon removal reactions at intermediate energies has been a powerful tool for single-particle structure studies of exotic nuclei [1], but the reaction mechanism is not fully understood [2-5]. One debated phenomenon is the asymmetric parallel momentum distribution (PMD) of the residual nucleus occuring occasional in one nucleon removal induced from light ion-targets [4,6,7]. Recent theoretical calculation of (p,pN) reactions with ^{14}O at 100 MeV/nucleon with the distorted-wave impulse approximation (DWIA) predicted also large asymmetric PMD for deeply-bound nucleon removal [4]. The low momentum tail is found to be due to the attractive potential between the residues and the outgoing nucleons and the steep falloff on the high momentum side is due to the energy and momentum conservation. Still, comparison with experimental data is necessary for validation and will be a basis for further spectroscopic factor studies. We have performed ^{14}O(p,pN)^{13}O and ^{14}O(p,2p)^{13}N reactions at $\sim$94 MeV/nucleon with a $\sim$2.4 mm thick solid hydrogen target at SAMURAI at RIKEN. Momentum of the residues were extracted from the SAMURAI spectrometer. An overview of the experiment and analysis will be given. We report the results for the cross section and PMDs, which exhibit that multiple reaction mechanisms occur. In addition to the (p,pN) knockout process, contributions of 50 % and 30 % from inelastic scattering (p,p') and transfer (p,d) for proton and neutron removal are observed, respectively. These processes should be considered in the analyses of one-nucleon removal cross section at intermediate energies for quantitative nuclear structure studies.

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