PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
Special Heavy Ion Discussion Group

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Quasi-Free (p,2p) Knockout Reactions of ^{23,25}F

The change of the neutron dripline from oxygen to fluorine indicates the $1d_{5/2}$ proton affects the neutron shell structure. This study aims to show how the $1d_{5/2}$ proton changes the neutron sd-shell structure in the neutron-rich ^{23}F and ^{25}F nuclei using proton removal spectroscopy. The spectroscopy is free from the effects of the proton shell structure, because the $1d_{5/2}$ proton in ^{23}F or ^{25}F is a single-particle state due to the $Z = 8$ magicity and sub-closed neutron shell. Therefore, the effect on the neutron-shell from the proton will be shown on the spectroscopy.

The quasi-free ^{23,25}F(p,2p) direct knockout reactions in inverse kinematics were performed in RIBF, RIKEN Nishina Center. Secondary beams of ^{23}F and ^{25}F were produced at ~280*A* MeV. The missing four-momentum of the residual oxygen (^{22}O or ^{24}O) was reconstructed using coincidence measurements of the incident nucleus and the two scattered protons. The excitation energy of the residue was then deduced.

From the experimental results, the occupation number of the $1d_{5/2}$ proton of ^{25}F was 0.1 ± 0.3 and the proton is indeed in a single-particle state. Meanwhile, the spectroscopic strength of the $1d_{5/2}$ proton of ^{23}F or ^{25}F were fragmented. These indicate that the $1d_{5/2}$ proton changes the neutron sd-shell structure, so that the neutron configuration mixing is large and the disappearance of $N = 16$ magicity in ^{23,25}F. The results suggest that the nuclear structures of the ^{23}F and ^{25}F demonstrate the Type-1 shell evolution. The comparison with the present shell model interactions (SFO, USDB, and SDPF-MU) indicated that the tensor force should be stronger. Also, the spectroscopic strength of the p-orbit was ~0.8 in ^{23,25}F, this shows that the short-range correlation in neutron-rich nuclei is similar to that of stable nuclei.

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11:00 a.m.
Building 203 Auditorium

Please note different day, time, and location