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Quasi-free proton knockout of ^{23,25}F

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The spectra of proton separation energy of ^{23,25}F were measured by (p,2p) quasi-free scattering. The spectroscopic factors (SF) of the proton bounded states were deduced by comparing with a DWIA calculation. We found that SF the $1d_{5/2}$ proton of ^{23}F and ^{25}F are 0.4 ± 0.1 and 0.9 ± 0.2 respectively. The deformation of ^{23}F nucleus may be the reason for the reduction. The result of ^{25}F can be understood as a result of the double magic of ^{24}O.

We have demonstrated a (p,2p) knockout reaction for probing the bounded states on neutron rich nucleus ^{23}F and ^{25}F. The ^{23,25}F were produced by BigRIPS in RIKEN
Nishina Center, Radioactive Isotope Beam Facility at 289A MeV and 277A MeV respectively. The proton separation energy was extracted by reconstructing the missing 4-momentum of oxygen residue by detecting the scattered protons. We managed to decompose the energy spectrum by selecting different oxygen isotopes, which were results of multi-neutrons emission of highly excited oxygen residue.

The reason for small sum of spectroscopic factors for the s-d shell proton of ^{23}F is not clear. The overall effect from the nuclear structure and reaction mechanism due
to deformation is still unknown. In contrast, the sum of spectroscopic factors of the s-d shell proton of ^{25}F is closed to unit and indicates that it is a single particle orbit.

The agreement of the reduction factor in the trend of the $R_S - \Delta S$ plot could be due to limitation of 1-neutron threshold. Also, the large reduction factor for the p-shell in both ^{23}F and ^{25}F shows that the trend depends on analysis method.

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