Production of the core fragments in the ground and excited states in nucleon removal from sd-shell nuclei (^{21,23}O,^{18,20}N, ^{22}F, ^{17}Ne).

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Recently, the experimental data on the neutron removal in sd-shell nuclei^{21,23}O, ^{18,20}N, ^{22}F leading to the core fragments in the ground and excited states became available [1]. Independently, one- and two-proton removal cross sections and the longitudinal momentum distributions of the^{15}O fragment in the ^{17}Ne break-up in light (C,Be) targets at low energies have been measured [2].

These data are analyzed in the eikonal approximation of the Glauber model. The calculations of the valence neutron wave function are performed in two different models, the potential model of the core-nucleon relative motion, and within the microscopic model. The spectroscopic factors of the valence neutron states in the ^{15,21,23}O, ^{18,20}N, ^{22}F nuclei, deduced from the experimental data on the excited core production, are consistent with the shell model predictions [2]. The calculated cross sections and longitudinal momentum distributions of the excited core fragment are compared to the experimental data.

It is found in calculations that in the nucleon removal reaction leads to a quadrupole polarization of the excited core fragment. The quadrupole polarization depends on the angular momentum of the projectile and core states. Thus, the angular distribution of the γ-quanta is anisotropic, and there is a core-γ angular correlation. Depending on the observation angle the deviation of the γ intensity from that of the isotropic γ-quanta emission in some nuclei can vary up to $\pm$30%.

The ^{17}Ne fragmentation in light (C,Be) target nuclei at energies from 20 to 700 MeV/nucleon is studied in the three-body (^{15}O+p+p) model. The interaction cross sections, the break-up cross sections, in particular, one- and two-proton removal cross sections, and the fragment momentum distributions are calculated with regard for the proton removal from the^{15}O core fragment. It can contribute at about 50% of the total proton removal cross section.

It is found, that the momentum distribution of the fragments in the one- and two-proton removal of the valence protons in ^{17}Ne is mainly determined by the s/d configuration mixing. It is suggested [4] that the question about the configuration mixing in ^{17}Ne can be resolved by invariant mass measurement of ^{15}O and spectator proton after the proton knockout.

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