# CHARGE EXCHANGE REACTIONS OF $^{12}$C-$^{19}$C AND THE BETA-DECAY STRENGTH

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Production cross sections of nitrogen isotopes from high-energy (~950 MeV per nucleon) carbon isotopes on hydrogen and carbon targets have been measured for the first time for a wide range of isotopes ($A$ = 12 to 19). The fragment separator FRS at GSI was used to deliver C-isotope beams. The cross sections of the production of N-isotopes were determined by charge measurements of forward going fragments. The cross sections show a rapid increase with the number of neutrons in the projectile. Since the production of nitrogen is mostly due to charge-exchange (Cex) reactions below the proton separation energies, the present data suggests a concentration of Gamow–Teller and/or Fermi transition strength at low excitation energies for neutron-rich carbon isotopes.

Figure 1 show the widows of a $C_{ex}$ reaction below the proton emission threshold and of the beta-decay. Because of a small neutron separation energy in neutron-rich isotopes, two windows are very close with each other for neutron rich nuclei. Therefore we can directly compare the measured beta-decay strength and the $C_{ex}$ reaction cross section.

Such a comparison was made for C isotopes and consistent results for nuclei of which beta-strength are known. In light nuclei most of the transition is allowed and thus no complications due to forbidden transition is seen. The $C_{ex}$ cross section increases for more neutron-rich C isotopes indicating the increase of sum of the beta strength within the window.

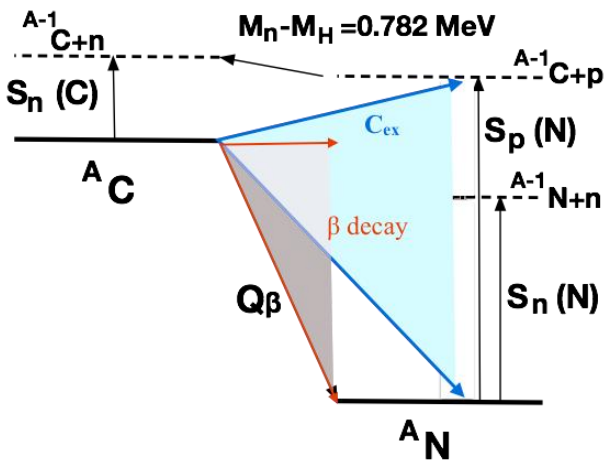


Fig. 1 Related nuclei and the relation between the separation energies ($S_n$, $S_p$) and the β-decay $Q$ value.

Since the two windows are almost same for nuclei along the r-process path because their neutron separation energy is at around 1 or 2 MeV, studies of charge exchange reactions of r-process nuclei would provide information on the total strength of beta decay complementary with the half-life measurement in which decay strength are weighted by the decay energy of each decay channel.

Experimental results of $C_{ex}$ measurement and comparison with the beta-decay will be presented.