

Neutron deficient exotic nuclei and the Physics of the "proton rich side" of the nuclear chart



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np pairing in N=Z nuclei studied through 2N transfer reactions

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Pairing in exotic nuclei is a subject of active research in nuclear physics. Of particular interest is the competition between isovector ($T=1$) and isoscalar ($T=0$) Cooper pairs, expected to occur in $N=Z$ nuclei.

Near ^{40}Ca and ^{56}Ni , earlier systematic analyses of two-neutron ($L=0$) transfer reactions [1,2] found the data consistent with a picture involving configuration mixing induced by simple pairing degrees of freedom of the valence neutrons. While providing evidence for isovector pairing in the form of pairing vibrations [2,3], the question of whether the isoscalar component generates collective modes is still an open one.

Direct reactions involving the transfer of an np pair from even-even to the low lying $0^+, 1^+$ states in odd-odd self conjugate nuclei could be excellent probes to study np correlations. While absolute cross-section values are always desirable, we note that the ratio $\sigma(0^+)/\sigma(1^+)$ itself provides an almost model independent measure of the pairing collectivity in the respective channels. Thus, the $(^3\text{He}, p)$ reaction stands out as an ideal tool to study np correlations.

Following a short overview of the subject, we will discuss a series of experiments carried out at the Argonne ATLAS facility to study the $(^3\text{He}, p)$ reaction in reverse kinematics and present results obtained with a beam of ^{44}Ti [4].

We will also speculate on the use of np knockout reactions and conclude by delineating a possible path as we move towards the next generation of rare isotopes facilities.

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Summary

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