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Proton –neutron pairs in N≈Z nuclei: a theory perspective

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The short-range proton-neutron interaction favors the formation of p-n pairs with parallel or antiparallel spin. They may appear as three species: T=1,J=0 (“isovector pairing”), T=0,J=1 (“isoscalar pairing”), and T=0, J=2j (“spin-aligned”). In N≈Z nuclei, so far accessible, there is clear evidence for strong isovector pair correlations. Evidence for isoscalar pair correlations is elusive. The reason seems suppression by spin-orbit splitting. Weakening of spin-orbit splitting is predicted for the region N≈Z>50, which may lead to a rise of isoscalar pair correlations. Based on Shell Model calculations, the formation of a “condensate”of spin-aligned pairs was suggested. The nature of such spin-aligned coupling scheme, its coexistence with isovector pairing, and the limits of pair classification due to the finite nucleon number will be discussed.

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