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Some aspects of the structure of neutron-rich F isotopes in the Particle-Rotor Model

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In this talk, we will discuss some aspects of the structure of neutron-rich F nuclei within the framework of the particle plus rotor model. Specifically, the low-lying structure of 25,27,29F can be understood in the rotation-aligned coupling scheme with their 5/2+ ground states as the bandhead of a decoupled band [1,2].
The excitation energies of the 1/2+ and 9/2+ states correlate strongly with the rotational energy of the effective core, seen by the odd proton, and allow us to estimate its 2+ energy. The Nilsson plus PRM picture suggests that the extra proton, with a dominant component in the down-sloping [220] ½ level polarizes the Oxygens and stabilizes its dynamic deformation. Thus, the effective cores could be interpreted as slightly deformed rotors with a modest e2 ≈ 0.15, as compared to the weak vibrational quadrupole collectivity in the real Oxygens.
Relevant to this interpretation are the recent studies of the 25F(p,2p) 24O and 25F(-1n KO)24O reactions carried out at RIBF/RIKEN [3] and NSCL/MSU [4] respectively. Derived spectroscopic factors suggest that the effective core of 25F significantly differs from a free 24O nucleus. The observed fragmentation of the πd5/2 single-particle strength agrees with the PRM calculations and arises from the effects of deformation and core overlap. We will also present results of the two-particles plus rotor model for odd-odd 28F [5] and 30F [6] and discuss further experiments that can shed further light on the validity of our interpretation.

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