LOW-LYING STRUCTURES OF EXOTIC SC ISOTOPES AND THE EVOLUTION OF THE N=34 SUBSHELL CLOSURE

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Recent investigations of exotic nuclei with *N*=32 and 34 have highlighted the presence of sizable subshell closures at these neutron numbers that are absent in stable isotones. Indeed, the development of the shell gap at *N*=32 is now well established from studies along the calcium, titanium, and chromium isotopic chains and, more recently, below the *Z*=20 core in potassium and argon isotones. The onset of a new subshell closure at *N*=34 was reported in ^{54}Ca owing to the relatively high energy of its first 2^+ state. On the theoretical side, the development of these neutron subshell gaps has been discussed, for example, in the framework of tensor-force-driven shell evolution; as protons are removed from the $\pi f_{7/2}$ orbital, the $\nu f_{5/2}$ state becomes progressively less bound and shifts up in energy relative to the $\nu p_{3/2}$–$\nu p_{1/2}$ spin-orbit partners. However, it was also reported that no significant *N*=34 subshell gap exists in titanium, despite the fact that an inversion of the $\nu f_{5/2}$ and $\nu p_{1/2}$ orbitals has been noted. Thus, the strength of the *N*=34 subshell closure in the scandium isotopes, which lie between calcium and titanium, provides additional insight on the migration of the $\nu f_{5/2}$ orbital in exotic nuclei. In the present work, the low-lying structures of the neutron-rich isotopes ^{54}Sc, ^{55}Sc, and ^{56}Sc—investigated using in-beam γ-ray spectroscopy with fast radioactive projectiles—will be presented, and the evolution of the *N*=34 subshell closure will be further examined. The results will be compared to modern shell-model calculations applied within the *pf* shell.