Changes in shell structure in A $\sim$ 60 neutron–rich nuclei as a function of spin

R.V.F. Janssens[1]

[1]*Physics Division, Argonne National Laboratory, Argonne, IL60439, USA*

Using the resolving power of spectrometers such as Gammasphere in combination with a variety of reactions ranging from fusion-evaporation with exotic beams or targets to deep inelastic reactions, it has been possible to investigate to fairly high angular momentum neutron–rich nuclei in a number of regions of the nuclear chart. The primary motivation for such studies is to provide the data required to characterize changes in shell structure as a function of the neutron–to–proton ratio that can be used to develop large–scale shell-model calculations and to characterize the impact of a large neutron excess on global properties, such as the nuclear shape, for example.

This presentation will review the nature of excitations in neutron–rich *fpg*–shell nuclei between Ca and Ni, where interactions incorporating the monopole tensor force are responsible for a neutron sub–shell closure at N=32 [1–3]. Also of particular interest in this region is the role of the $g_{9/2}$ orbital in driving the nuclear shape as has been demonstrated by the presence of collective excitations at moderate spin in neutron–rich Cr, Fe and Mn isotopes [4–6]. This suggests that mixing between the "deformed" and the "shell–model" states might have a strong influence on their properties. This presentation will conclude with a discussion of recent results obtained in the direct vicinity of ^{68}Ni [7].

This work is supported by the U. S. Department of Energy, Office of Nuclear Physics, under contract No. DE-AC02-06CH11357.

---

[1] A. Huck *et al.*, Phys. Rev. **C 31**, 2226 (1985); A. Gade *et al.*, Phys. Rev. **C 74**, 021302 (R) (2006).
[2] R.V.F. Janssens *et al.*, Phys. Lett. **B546**, 55 (2002).
[3] J.I. Prisciandaro *et al.*, Phys. Lett. **B510**, 17 (2001).
[4] S. Zhu *et al.*, Phys. Rev., **C 74**, 064315 (2006) and references therein.
[5] D. Steppenbeck *et al.*, Phys. Rev. **C 85**, 044316 (2012) and references therein.
[6] D. Steppenbeck *et al.*, Phys. Rev. **C 81**, 014305 (2010) and references therein.
[7] S. Zhu *et al.*, Phys. Rev. **C 85**, 034336 (2012) and references therein