

Robustness of the N=34 shell closure: First spectroscopy of ^{52}Ar

Tuesday, 5 June 2018 11:54 (18)

It is now well known that the magic numbers are not universal across the nuclear landscape and that new shell closures may emerge in nuclei far from stability. In particular, a new subshell closure at N=34 has been reported in ^{54}Ca . While the systematics of the $E(2^+)$ of the Ti isotopes does not show any evidence for the existence of the N=34 subshell closure, the significant 2^+ excitation energy in ^{54}Ca was a sign of its doubly magic character. For ^{52}Ar , no spectroscopic information has been measured, however, its $E(2^+)$ was predicted to be the highest among Ar isotopes with $N > 20$, suggesting a robust N=34 shell gap. The spectroscopy of ^{52}Ar thus offers a unique chance to explore the robustness of the N = 34 subshell closure and pin down the mechanism at the origin of its emergence.

The measurement of ^{52}Ar was performed at RIBF at RIKEN using the spectrometers of BigRIPS and SAMURAI. The low-lying states of ^{52}Ar were populated via $^{53}\text{K}(p, 2p)$ and $^{54}\text{Ca}(p, 3p)$ reactions at ~ 240 MeV/u. The selectivity of the $(p, 2p)$ and $(p, 3p)$ channels is used to build the level scheme of ^{52}Ar . The challenge posed by the low secondary beam intensity was tackled by the combination the MINOS device with a 150-mm thick liquid hydrogen target and the recent upgraded high efficiency DALI2+ gamma detector array. In the presentation, we will report on the first in-beam gamma spectroscopy of low-lying states of ^{52}Ar , and discuss the robustness of the N=34 shell closure in light of shell model and ab initio calculations.

Summary

Primary author(s) : Dr LIU, Hongna (CEA, Saclay)

Co-author(s) : Dr OBERTELLI, Alexandre (TU Darmstadt); Dr CALVET, Denis (CEA Saclay); Dr BROWNE, Frank (RIKEN Nishina Center); Dr BABA, Hidetada (RIKEN); Dr DOORNENBAL, Pieter (RIKEN Nishina Center); Dr SUN, Yelei (CEA Saclay)

Presenter(s) : Dr LIU, Hongna (CEA, Saclay)

Session Classification : Session 6