Evolution of the Ar isotopic chain: the N=28 shell gap south of ^{48}Ca

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Spectroscopy of the moderately neutron-rich nuclei in the region of the doubly-magic ^{48}Ca has been possible only recently by means of deep inelastic stable beam reactions and the use of radioactive beams [1,2]. Such a region offers the unique opportunity to study the evolution of the nuclear properties when removing few nucleons from a doubly-closed configuration. Structural changes have been verified moving away from the doubly magic nucleus along the N=28 isotones and explained as the possible quenching of the $N = 28$ shell closure south of ^{48}Ca [3] due to the monopole interaction. A new method to measure lifetimes in neutron rich nuclei combining the high resolving power of the gamma spectrometer CLARA [4] together with the large selection capability of the magnetic spectrometer PRISMA [5] in combination with the Köln plunger has become available at the Legnaro National Laboratory for lifetime measurements. The Z=18 Ar isotopes for mass A=44,46 have been populated and the lifetime of the excited states determined. In the case of ^{44}Ar, gating on the total kinetic energy loss, it has been possible to control the entry point of the reaction channel and therefore the presence of the feeders from above. The lifetimes for the first excited yrast states up to the 6^+ have been measured and the reduced transition probabilitiy derived. In the case of ^{46}Ar nucleus the shorter lifetime of the first 2^+ has been extracted in a comparison with a simulation result [6]. The deduced subpicoseconds lifetime is shorter than the accepted value obtained in relativistic coulex experiment. Based on the aforementioned results the BE2 trend has been obtained while approaching the N=28 magic number. The trend confirm the persistence of such a shell gap for Z=18.

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