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Evidence for Z=6 Subshell Cclosure in Neutron-rich Carbon Isotopes

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The nuclear magic numbers, as we know in stable nuclei, consist of two different series of numbers. The first series – 2, 8, 20 – is attributed to the harmonic oscillator potential, while the second one – 28, 50, 82, and 126 – is due to the spin-orbit interactions. The spin-orbit interactions are known to be significant and responsible for the large (spin-orbit) splitting of the single-particle states in heavy nuclei. These interactions, however, are expected to diminish in light nuclei due to the low orbital angular momenta. This general expectation is supported by the fact that there is an apparent lack of fingerprints for a magic number' (subshell closure) at 6 or 14 [1], which might have arisen from the widening 1p1/2-1p3/2 and 1d3/2-1d5/2 gaps, respectively, in the stable nuclei. A possible subshell closure at N=6 has been suggested both theoretically [2] and experimentally [3] in the very neutron-rich 8He isotope. For Z=6 and 14, possible subshell closures have been suggested [4] in the semi-magic 14C and 34Si.
In this talk, we will present experimental evidence for a prevalent subshell closure at proton number Z=6 in the neutron-rich carbon isotopes. We investigated (i) the point proton density distribution radii, combining our recent data for Be, B and C isotopes measured at RCNP, Osaka University and GSI, Darmstadt, with the available data from Ref. [5]; (ii) the atomic masses [6]; and (iii) the electromagnetic transition strengths [7] for a wide range of isotopes. Our systematic analysis revealed marked regularities which support a prominent protonmagic number' Z=6 in 13–20C.

References:

[1] M. G. Mayer, Nobel Lectures in Physics, 20 – 37 (1963).
[2] T. Otsuka et al., Phys. Rev. Lett. 87, 082502 (2001).
[3] F. Skaza et al., Phys. Rev. C 73, 044301 (2006).
[4] I. Angeli and K. P. Marinova, J. Phys. G: Nucl. Part. Phys. 42, 055108 (2015).
[5] I. Angeli and K. P. Marinova, At. Data Nucl. Data Tables 99, 69 – 95 (2013).
[6] M. Wang et al., Chinese Phys. C 36, 1603 – 2014 (2012).
[7] B. Pritychenko et al., At. Data Nucl. Data Tables 107, 1 – 139 (2016).

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