Xiaodong Li et al., J Astrophys Aerospace Technol 2017, 5:3 (Suppl)
DOI: 10.4172/2329-6542-C1-011

Nuclear stability from another point of view

Xiaodong Li, Qijun Liu, Gongyi Li, Yihe Li and **Zengyong Chu**
National University of Defense Technology, China

For an element, some isotopes are stable and some are not. Quantum theory rationizes "magic number" and explains some of the reasons. For a comprhensive and visual understanding, one may need a model to directly explain the comlexity. Based on the newly proposed nuclear structure model of "folding ring plus extra nucleon", one can derive the following conclusions: 1) For nuclei, if the number of proton (P) is larger than that of neutron (N), they must be unstable (except ^{3}He, which is not a ring). 2) If extra N besides ZP+ZN ring can attach to at least 2 ring P's with suitable geometrical arrangement based on the model, the nuclide will be stable. The extra N bridges 2 ring P's to stabilize some less stable rings (like ^{9}Be). 3) Any ring with a free P_2N_2 fragment will release an α-particle along with another smaller ring (like ^{8}Be, which splits into two ^{4}He's). 4) Odd Z elements are generally less stable than those of even Z, because the odd Z ring must be eccentric (the gravity centers of the P and N can not be superposed), which accompanied with lower binding energy per nucleon (E_B/A). 5) For odd Z ring, odd number of extra N may reduce the eccentricity, leading to higher E_B/A, while for even Z rings, odd number of extra N arouses eccentricity, leading to lower E_B/A. This situation is demonstrated in unexceptional zigzag E_B/A variation of all the isotopes of any reported element, where in odd Z elements, vertex at odd A; while in even Z elements, vertex at even A. 6) For large Z elements, which is based on a large ring, more extra N are necessary to fill the larger void space of the ring even though it is folding. This is another function of extra N, The N/P ratio of the stable zone increases with higher Z, the maximum N/P ratio should be 1.5 (every two ring P's hold one extra N). Arguably, some heavy stable nuclides, such as ^{208}Pb, may be eventually found to be unstable with extra long life time. The stablity island with both large magic number seems to be impossible because it needs very high N/P ratio to fill the very large void space.

Biography

Xiaodong Li has completed his PhD from Université de Montréal (1993), MS from Nankai University (1981), BS from Tianjin University (1977). He is a Professor in NUDT reseaching and teaching in the fields of polymer chemistry, material chemistry and physics, crystal and structure chemistry and physics.

xdli0153@sina.com

Notes: