NUCLEAR SHELLS AND THE STRUCTURE OF THE ENERGY SURFACE OF HEAVY ELEMENTS

Kolesnikov N.N.
Moscow State University, Russia
E-mail: nkoles@mail.ru

We proceed from the idea issued from experiments [1] and shell model that it is possible to divide the nuclear binding energy surface into the regions inside of which the binding energy of both protons (B^p) and neutron (B^n) are presentable as a linear functions of number of protons (Z) and neutrons (N). Boundary lines between regions along Z or N are considered as (sub)magic numbers. The values of all parameters of energy surface and the (sub)magic numbers themselves were searched by means of solution of an inverse problem at requirement that these reproduce the experimental binding energy B^p and B^n for all heavy and superheavy nuclei compiled in [2] and in [3]. The final results for them are given in [1]. For convenience the results obtained for B^p and B^n are reduced on the line of beta-stability (see [1]). Now in the Fig. 1 the reduced energies B^n are presented: the lower curve refer to (even Z-even N) nuclei; the next line above- to odd-even nuclei; then follows line of odd-odd nuclei and the last - of even-odd ones; moreover the line denoted as C corresponds to the values averaged over all parities. As it is seen from Fig. 1, after magic number $N = 126$ (fall, -2.1 MeV), the most important subshells are $N = 152$ (–0.4 MeV), $N = 162$ (–0.2 MeV) and $N = 170$ (+0.2 MeV). For protons after shell $Z = 82$ (fall, –1.6 MeV) the most important subshells are $Z = 100$(–0.4 MeV) and $Z = 92$(–0.3 MeV), see [1].

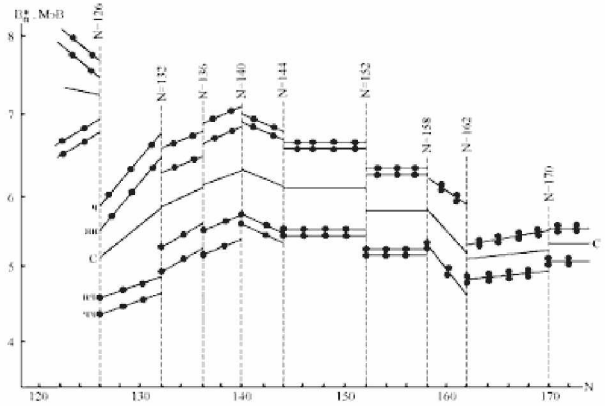

Fig. 1. Reduced binding energy of neutron. Neutron shell effects.

1. N.N.Kolesnikov // Preprint №8/2008. Physical Faculty. MSU.
2. R.B.Firestone *et al.* // Tables of Isotopes. 8-th. ed. New York, 1996.
3. Yu.Ts.Oganessian // J. Phys. G: Nucl. Phys. 2007. V.34. P.R165.