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Binding energies and the energy surfaces in the Region of the heavy Natural radioactive isotopes

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The binding energies of these isotopes can be computed relative to the last members of their families by means of combinations of α and β decay energies. By the following method of interpolation we computed them relative to ^{206}Pb, the last member of the U-family. As is well-known the binding energies of the isotopes are lying on three surfaces in the n, A, E spaces; one for N and Z even, one for both odd, and one for N or Z even (n = neutron excess, A = mass number, N = number of neutrons, Z = number of protons). Sections of these surfaces with planes N, Z or A constant will nearly be parabolas in the region of maximum binding energies for isobars. We can therefore adjust the-family to the U-family by claiming, that the binding energies of the $e - e$ isotopes from these families with the same N or Z must fit to one parabola as accurately as possible. Then the $e - e$ and the $o - o$ surface are known respective to the binding energy of ^{206}Pb.

In order to adjust the odd mass families to the U-family we assume, that the $e - o$ surface lies in the mean halfway between the $e - e$ and the $o - o$ surface. The distance between the last two surfaces is found for some values of A by claiming, that the binding energies of isobars with even mass must lie on two parallel parabolas. The distance seems to increase from 1,8 MeV to 2,0 MeV for A = 210 to A = 218, and then to decrease to 1,2 MeV for A = 235.

In order to study the distance between the $e - o$ and the $e - e$ surface we consider an isotope with a value N or Z used in adjusting the Th- to the U-family. For this isotope we compute the height on the estimated parabolic section with the $e-e$ surface used. The difference with the binding energy of the isotope relative to the last member of its family will be a fair estimate of the distance between the $e - e$ and the $e - o$ surface, increased by the difference in binding energy of ^{206}Pb with ^{207}Pb or ^{209}Bi. The distances obtained in this way follow a course with A analogous to the distance between the $e - e$ and the $o - o$ surface, so it is possible to choose the differences in binding energy mentioned in such a way, that the $e - o$ surface is lying fairly well halfway the $e - e$ and the $e - o$ surface.

The result of our computations will be published in Physica.