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Autor: Wapstra, A.H.
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Binding energies and the energy surfaces in the Region of the heavy Natural radioactive isotopes

by A. H. Wapstra, Amsterdam.

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.