Atomic Nuclei Binding Energy

Similarities between Binding Energy Values of Chemical Elements : Example of Nickel and Copper

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Several authors predict that alpha particle structures are present in atomic nuclei.Convincing arguments of such structures are provided by systematics of the binding energy of the even-even nuclei with equal number of protons and neutrons. So, it is to see if this is the case for any nucleus. A first point to consider is the binding energy (E_B) of an alpha particle and its relationship with the binding energies of Deuterium,Tritium and Helium-3. A second point is to see if these E_B values play a role in the E_B of any nucleus. In other terms ,could one determine the E_B value of any nucleus on hand of those of alpha particle, Deuterium,Tritium and Helium-3 ?

To do so it is to compare as many nuclides as possible. The present study takes the cases of several isotopes of Nickel and Copper in order to look for similarities between them.
The author tries to organize the atomic nucleus in a way similar to Pauling's model of nuclear structure,with some clusters within the nucleus Pauling called Spherons. The sub-nuclei taken into consideration by the author are the alpha particles and four types of bonds, determined in the following way :

- Deuterium-like bond, called NP with value 2.2246 MeV, linking a neutron of one alpha particle with a proton of a second alpha particle, or a neutron or proton outside an alpha particle to that alpha particle.

- Tritium-like bond, called NNP with value 8.4818 MeV, linking three nucleons of three different alpha particles, or one or two nucleons outside an alpha particle to one or two alpha particles.

- Helium -3 like bond, called NPP with value 7.718 MeV, having a similar function as NNP.

- A dineutron bond, called NN with value 4.9365 MeV, linking two neutrons not being located within the same alpha particle .This bond value is deduced from the alpha particle binding energy.

The study of the binding energy values of the chemical elements aims at understanding the mechanisms of transmutation and hence the possibility of cold fusion.

References

[1] Philippe Hatt, J.Condensed Matter Nucl. Sci.**26** (2018) 45-53.
[2] Philippe Hatt, J. Condensed Matter Nucl. Sci.**29** (2019) 260-274.