New possibility of neutron generation for scientific and applied aims by fusion reactions of light nuclei

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- It is known very effective reaction experimental observed in 1942 from Phys.Rev. (I.V. Kurchatov, G.N. Flerov, N.N. Flerov, A.M. Kutcher (Stalin Prize, 1951)
- $^{2}H + ^{3}H = ^{4}He + n + Q$ (1)
- σ= 5 barn; E(^{2}H)=100 keV!

- This reaction used in present time on last stage of explosion hydrogen thermonuclear bomb: (n – from the explosion ^{235}U-bomb n + ^{6}Li = ^{4}He + ^{3}H (reaction (1)) Ginzburg (1948), the soldier O.A. Lavrent'ev (1951), A.D. Sakharov слойка, шихта (Stalin prize 1953, Nobel prize) = n + ^{238}U $\rightarrow$ fission Q = 200 MeV!
- The reaction (1) is used also in detector explosives and drugs.

- From analysis of binding energy of nucleons in atomic nuclei (the invention of JINR) I track dawn of the new invariant for binding energy of protons and neutrons in atomic nuclei:
- [S_{p1} (Z,N)+S_{n2}(Z-1,N) = S_{n1}(Z,N) + S_{p2}(Z,N-1)] (2),
- Where Z=N even index 1 – for valence nuclei, 2 – for prevalence nuclei (Fermi nuclear model).

- The proof of the invariant is the equality of left and right parts of the invariant (2) equaled to the one value: $-m(Z,N) + m[(Z-1)(N-1)] + m(^1H) + m(n)$ From invariant (1) I have the next consequences – also invariant:
- $S_{n1}[(Z-1),N] - S_{p2}[Z,(N-1)] = S_{n1}(Z,N) - S_{p1}(Z,N)$(3)

- The consequence (3) taken many times is the illustration forced induced (not spontaneous) breaking up of the charged super symmetry of the binding energy of nuclei in Standard Model: from total super symmetry nucleus ^{2}H
- $S_n(^{2}H) - S_p(^{2}H) = 2224{,}57 – 2224{,}57$ keV = 0,000000 (six zero after point) and
- $S_n(^{3}H) - S_p(^{3}He) = 0{,}76376$ and
- $S_n(^{4}H) - S_p(^{4}He) = 0{,}76376$ etc.

- $S_n(^5He)$ - $S_p(^5Li)$ = -890 – (-1970) = 1080 ; $S_n(^6Li)$ - $S_p(^6Li)$ = - $S_p(^6Li)$ = 5,660 – 4,590 = 1070! And so on to super heavy, to super distance transuranic nuclei with Z=118 and M=293.

Nucleonic structure compound nucleus ^5He in reaction (1)

- I have from destructing of nucleus ^5He:
- $S_{n1}(^5He) + S_{n2}(^4He) + S_{n3}(^3He) + S_{n4}(^2He) =$
- -890 20577,62 2224,57 2224,57
-
- $= S_{p1}(^5He) + S_{p2}(^4H)$
- 51800 no value

- Using invariant (1) I have
- $S_{p1}(^3He) + S_{n2}(^2H) = S_{n1}(^3He) + S_{p2}(^2He)$
- 5493,48 2224,57 2224,57 5493,48

- I obtained from this relation two energetic channels of emission of neutron:
- Q1=17589,25 + 890 = 18479,25
- Q2=17589,25 – 2224,57 = 15364,69
- It is question for experiment.

Nucleonic structure compound nucleus ^4He of reaction (4)

- $^2H + {}^2H = {}^3He + n$ (4)
- $S_{n1}(^4He) + S_{n2}(^3He) = S_{p2}(^3H) + S_{p1}(^4He)$
- 20577,62 2224,57 no value 19813,86

- From invariant (2) I obtained
- $S_{p2}(^3H)$=8481,80 - $S_{n2}(^3H)$(2224,57) - $S_n(^2H)$(2224,57)
- $B(^3H)$ 23431,61 - 14949,81 = 8481,80
- Q1=3267,47 – 2224,57 = 1042,5

- But in article “Possibility of synthesizing super heavy elements in nuclear explosions” A. Botvina, I. Mishustin, V. Zagrebaev and W. Greiner:
- “The possibility to produce super heavy elements in the course of low-yield nuclear explosion is analyzed within a simple kinetic model which includes neutron capture, γ-emission, fission and particle evaporation from exited nuclei.

- We have calculated average number of absorbed neutrons as well as mass distribution of U and Cm nuclei exposed to an impulsive neutron flux. It is demonstrated that detectable amounts of heavy nuclei absorbing 20-60 neutrons may be produced the multeplay β–decay may rich long time elements of “island of stability”.

- The solution of puzzle “p-nucleus” is
- (IS – isotopic abundance)
- IS ^{6}Li=7594% ^{7}Li=92414% ∑=100,008%
- ^{10}B=19,97 % ^{11}B=80,17% ∑=100,14%
- ^{14}N=99,6327% ^{15}N=0,3687% ∑=100,0014%

- ^{16}O=99,75716% ^{17}O=0,0381% ^{18}O=0,20514% ∑=99,9504%
- ^{20}Ne =90,483% ^{22}Ne=9,253% ^{21}Ne =0,271% ∑=100,0007%
- ^{24}Mg=78,99% ^{25}Mg=10,001% ^{26}Mg=11.013% ∑=100,004%
- The consideration of emission of neutron follows from invariant (2) (see above).