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On the neutronic Equilibrium of non radioactive Elements.

O neutronowej równowadze pierwiastków niepromieniotwórczych.

Streszczenie.

Autor stwierdza, że zapomocą α, β lub H-przemian niepodobna odtworzyć istniejącego układu pierwiastków i ich izotopów i to zarówno przy dezintegracji, jak i przy tworzeniu się z elementów prostszych. Jedynem założeniem koniecznem jest przyjęcie hipotezy o istnieniu równowagi neutronowej pomiędzy poszczególnemi izotopami. Autor zakłada dalej, że neutrony mogą spowodować spadek elektronu na jądro, co ze swej strony prowadzi do utworzenia izotopu cięższego pierwiastka o liczbie atomowej niższej. Izotop ten ulega rozkładowi z wydzieleniem neutronu.

Rękopis otrzymany dn. 14 listopada 1932.

If we suppose that the chemical elements are submitted to a spontaneous decomposition, it is obvious that each atom must possess its ancestor and its succeeder. It can be proved by analysis of the table of existing elements, that the α-and β-transformation are not able to explain the derivation of all elements and their known isotopes. Really, if we represent the weight of the atom A_n, where A is the atomic weight and n the atomic number of the element, by the equation:

$$A_n = n\,(2\,Pr + E) + x\,(Pr + E) + \Delta M,$$

where $(2\,Pr + E)$ represents the mass of the semihelium-group and $(Pr + E)$ the mass of one neutron, ΔM the packing effect of the nuclei, it follows, that x changes in the limits from 0 (helium and some other light elements) to 54 (Ur). The α-transformation do not change x, the β, however, produces an augmentation of x by 2 units. The last

change is not sufficient to reproduce all kinds of atoms and all isotopes of a given element.

If the protonic transformation could take place, each $H^{\bullet}$ transformation would produce a diminution of x for unity, this cannot be reconciled by any way with the existing kinds of atoms.

The existence of scandium 45 is a typical example proving that the explanation of the formation of light elements by the α, β and $H^{\bullet}$ transformation of the heavier atoms is impossible. Indeed, Sc_{45} can not be deduced from V_{51} by emission of an α particle, neither from Ti_{48} by emission of an electron.

Other suppositions submitting the decomposition of heavier elements in two lighter atoms lead to impossibility of reproducing all specimens of atoms and their isotopes. This can be also established when the formation of the heavier elements is considered as the transition from light atoms by introducing of α-particles, protons or electrons. One hypothesis only is able to explain the formation af all kinds of atoms; it is accepting the supposition, that the isotopes can emit or adjoin neutrons, by establishing under the given conditions a neutronic equilibrium: for inst.

$$O_{18} \rightleftarrows Nr + O_{17}$$
$$O_{17} \rightleftarrows Nr + O_{16}$$

The concentration of each isotope is regulated by the rate of formation or of decomposition of corresponding isotopes.

If we consider that the neutrons can be emitted by the elements, it seems to be possible to admit that the neutrons can produce a small ionisation, an emission of X-rays by substances, and in some cases, when the velocity of a neutron is sufficienty great, they can produce a fall of an electron into the nucleus:

$$A_n + E \rightleftarrows A_{n-1}$$

In this case a very durable heavier isotope could be formed, which immediately could be transformed into a lighter existing isotope. For inst.

$$F_{19} + E = O_{19}$$
$$O_{19} \longrightarrow Nr + O_{18}$$
$$O_{18} \longrightarrow Nr + O_{17}$$
$$O_{17} \longrightarrow Nr + O_{16}$$

If the helium atom could be submited to the same transformation, the following processes could take place:

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$$He^{\bullet\bullet} + E = H_4^{\bullet}$$
$$H_4^{\bullet} \longrightarrow 3\ Nr + H_1^{\bullet}$$

This transformation could exist only in the case, if the energy of formation of three neutrons would be greater than the energy of formation of one helium atom. This do not agree with the determination of the mass of a neutron executed by C h a d w i c k. Accordingly with Mr. C h a d w i c k's data, the mass of a neutron is considerably greater than unity (1,006).

It must be noted, that the existence of the reaction:

$$A_n + E \longrightarrow A_{n-1}$$

could be proved only by emission of the neutrons.

Manuscript received November 14, 1932.

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