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Purposeful Synthesis of Chemical Elements and Ecologically Pure Mobile Sources of Energy

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Once dashing development of such geological sciences as geochemistry, geophysics, geotectonics, petrography based on classical laws of thermodynamics got considerably slower on the century threshold. The accumulated wealth of material about nature and chemical elements abundance, the mantle processes geodynamics, metallogeny and petrogenesis, hydrocarbon formation has raised the same question simultaneously in all geological disciplines – the question of a universal source of energy and material which could support the variety of the said processes in history of the Earth.

Geochemistry and petrology are exactly those science disciplines which have accumulated a valuable material on agent evolution in the Earth history. Nevertheless, so far this wealth has not been embraced by a common, comprehensive evolutionary idea which could solve and give answers to a number of questions raised by geochemistry and petrography before geology and science in general.

The marked above physical theories fast established in scientific practice allow us to argue that to solve the majority of accumulated problems and contradictions in the junction of modern knowledge of geochemistry, petrology, mineralogy and ore-formation processes we should speak not about complex atom structure and its place in material structures and symmetries but about its complex **behaviour** and **condition** considering atom of chemical element as a process. In other words, it is necessary to persistently and consistently change over to consideration of alterations (redistribution) in its own dynamic system – mass-energy – in history of chemical evolution of the Earth.

The named physical postulates, on one hand, are extensive geochemical material on dispersion, isomorphism and paragenesis of chemical elements, and, on the other hand, show that in history of geochemical Earth evolution there is a symmetric nuclei division. We suggest to calling the phenomenon of symmetric division a nuclear dissociation (cold dissociation).

Taking isomorphism as a complex value of chemical elements' affinity rate, on basis of over five hundreds evidences of their isomorphic relations in minerals and formations there has been built a diagram (Figure 1).

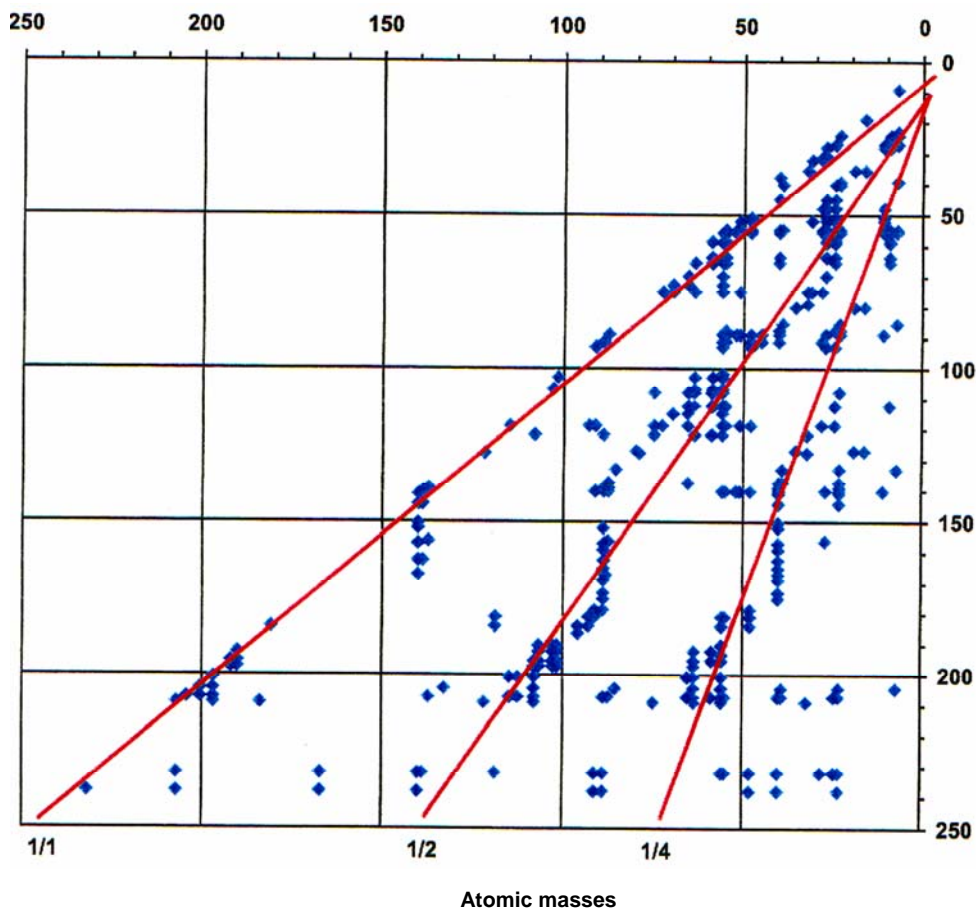


Figure 1.

Isomorphic ratio of elements according to their atom masses. The replace atomic masses are on abscises, the replaced atomic masses are on ordinate. The ratios of atomic masses 1/1, 1/2 and 1/4 disposed along lines 1/1, 1/2 and 1/4.

It reflects the general tendency of the process of nuclear dissociation in conditions of crust, from uranium to hydrogen.

The processes of nuclear dissociation preferably develop by the way of correlation of atomic masses and atomic charges of isomorphically replacing each other elements with the ratio $\frac{1}{2^n}$; where $n = 0..4$.

In what conditions can we expect the process of nuclear dissociation? The geophysical and geochemical data show that the basic state of substance in the Earth's subsoil, in which there is a possibility of evolution, is, first of all, protomagma and magma solutions-melts forming plums-upwellings and gas-liquid fluid-dynamic systems separating from them. It has been found that plum-upwelling systems are generated on the border of the Earth core and the lower mantle experiencing severe RT conditions. As it has been shown before [2] in such conditions chemical agent in great depth lose its periodicity and chemical elements no longer comply with Mendeleev law and plutonic substance itself is presented as naked nuclei and free electrons with a quite high free-running frequency and a high speed of rotation around their own axes. Let us call these dynamic systems **protonucleus**.

So, which general physical laws in nature can control and be responsible for such an express, almost multiple division of protonuclei and nuclei of chemical elements? The said multiplicity of division is determined by two important mutually complementary regularities.

The first regularity. Multiple division of protonuclei complies with the universal principle of resonance synchronisation and self-organisation of micro- and macrosystems suggested by F.A. Gareev [1].

Let us consider decomposition of two resonances r and R through the following binary channels: $r \rightarrow a + b$, $R \rightarrow A + B$ presuming that $a = A$ and $b = B$. Then energies of the particles $A(a)$ and $B(b)$ will be determined with the following equations:

$$E_A = \frac{m_R c^2}{2} + \Delta E_{AB}, E_B = \frac{m_R c^2}{2} - \Delta E_{AB}, E_a = \frac{m_r c^2}{2} + E_{ab}, E_b = \frac{m_r c^2}{2} - \Delta E_{ab}, \quad (1)$$

$$\Delta E_{AB} = \frac{(m_A^2 - m_B^2) c^2}{2m_R}, \quad \Delta E_{ab} = \frac{(m_a^2 - m_b^2) c^2}{2m_r}. \quad (2)$$

The empirical research on distribution of masses of chemical elements in isomorphic compositions have shown that atom nuclei and protonuclei are natural resonances which very often decompose through the same binary channel where the difference of energies of decomposed particles from half of rest mass of considered protonuclei resonances is in inverse proportion to mass of corresponding resonance.

The second regularity. Multiple binary division of atom nuclei and protonuclei can be explained using the law of rotating free bodies: mass centres of all free rotating bodies formed by decomposition of primary protonucleus body have the same lineal speed:

$$V_c = R_{ci} \frac{2\pi}{t_i} = R_{ci} \omega_i = const, \quad (3)$$

where R_{ci} – rotation radius of protonucleus i ; ω_i – angle rotation speed of protonucleus i ; t_i – its rotation time.

Note two conclusions resulting from the given correlation:

The first : mass of nucleus m limited by rotation radius R_{ci} makes half of mass of the primary protonucleus m_i . In other words, in rotation radius protonuclei mass is divided exactly in two; analytically this can be expressed as:

$$m_{ci} = \frac{1}{2} m_i, \quad (4)$$

where m – mass limited by rotation radius R .

The second: in absence of density gradient rotation radius is determined by the following ratio:

$$R_{ci} = \frac{R_i}{\sqrt[3]{2}}. \quad (5)$$

The given ratio suggests invariability of volume occupied by protonucleus before and after its division.

Assuming that atom nuclei and protonuclei in plum-upwellings, fluid-dynamic systems have high frequencies of rotation and vibration, the division action itself starts at the moment of resonance influence on atom nuclei and protonuclei from outside.

Negotiation of potential barrier (or nucleus division barrier) develops afterwards as a process of resonance tunnel transpiration through the barrier which is well-known in quantum mechanics. In result a separated group of nucleons forms a new atom nucleus making an isomorphic pair of elements with the initial (mother) protonucleus (see Table 1).

The most studied isomorphic pairs of elements as an example of multiple binary division of protonuclei.

Table 1

1. Pt	<u>R=2,240 → R_c=1,778</u>	9. Fe	<u>R=1,476 → R_c=1,171</u>
Rh	R=1,810	Al	R=1,158
2. Re	<u>R=2,208 → R_c=1,758</u>	10. Fe	<u>R=1,476 → R_c=1,171</u>
Mo	R=1,768	Mg	R=1,118
3. Ta	<u>R=2,184 → R_c=1,734</u>	11. Ti	<u>R=1,402 → R_c=1,113</u>
Nb	R=1,749	Si	R=1,174
4. Hf	<u>R=2,174 → R_c=1,762</u>	12. Ti	<u>R=1,402 - R_c=1,113</u>
Zr	R=1,743	Mg	R=1,118
5. Lu	<u>R=2,160 → R_c=1,714</u>	13. Ca	<u>R=1,321 → R_c=1,049</u>
Y	R=1,724	Mg	R=1,118
6. Cd	<u>R=1,864 → R_c=1,479</u>	14. Ca	<u>R=1,321 → R_c=1,049</u>
Zn	R=1,556	Na	R=1,098
7. Nb	<u>R=1,749 → R_c=1,388</u>	15. K	<u>R=1,311 → R_c=1,040</u>
Ti	R=1,402	Na	R=1,098
8. Rb	<u>R=1,701 → R_c=1,350</u>		
K	R=1,311		

Physical basis of the empiric conclusion about multiplicity of protonuclei division is the universal principle of resonance synchronization and self-organization of micro- and macro-systems. It suggests that elementary particles, atom nuclei, atoms in crystals and organic compositions have quasicrystal homologous structures based on the same fundamental physical laws, and their corresponding frequencies, speeds, impulses and movement energies are quantized, comparable and, consequently, synchronized.

As a result of synchronization and self-organization of protonuclei in magma sources and fluid-dynamic systems an infinite number of protonuclei and chemical elements, which can be considered as sets, enter the lithosphere and the Earth crust. Generally, such sets occur in nonlinear dynamic systems and, first of all, in discrete dynamic systems. Such sets are dynamic fractals.

We can assume that as a result of nuclear dissociation processes in the lithosphere and the Earth crust occur and develop symmetry structures representing two simplest types of fractals. The first fractals are dendrites, i.e. when some set is parted into groups of two elements having similarity with binary system of calculation. The second ones are the Cantor set or Cantor dust.

The fractal features of the Cantor dust have a great meaning in geochemical nature of the Earth as many fractals have the similar features of set. Presenting chemical elements as the Cantor dust formed in result of nuclear dissociation of protonuclei we are, finally, close to solution of the primary problem of geochemistry – the problem of dispersion of chemical elements in the lithosphere and the Earth crust.

The found number of correlations allows us to conclude that protonuclei and atom nuclei of chemical elements are microsystems built under the mathematical principle of sequential distribution of series of numbers of significant values.

Consequently, the basis of origin of every chemical element is its **antecedent** protonucleus or atom nucleus performing its function. This allows to conclude that the major number of chemical elements is **generated** (occur) not simultaneously but sequentially in course of nuclear dissociation (cold dissociation) of protonuclei and atom nuclei in geochemical evolution of the Earth and the Solar system.

Altogether there has been determined seven such sequences. In general they coincide with the periodic sequence of Mendeleev's table but located in reverse order emphasising the character of nuclear dissociation process. The specified sequence of element formation can be presented using a self-similar fractal such as the Cantor dust.

A convincing example of reality of nuclear dissociation processes in the Earth crust is presence of binary system of chemical elements in minerals of ore substance. The elements forming pairs have quite close atom masses owing to the fact that they are generated from one protonucleus or atom nuclei, as it was shown above, in result of division of its mass into two approximately even parts. The occurred this way chemical elements in conditions of further mineral forming form independent ore minerals or comprise more complex minerals. This situation is much more often seen in nature as these pairs of elements represent one of the branches of nuclear dissociation of massive protonucleus. Here are some most often met pairs of elements and minerals.

Be – Li – beryl-lepidalite; *Fe – Mn* – granites; *Fe – Ni* – pentlandite; *Fe – Cu* – chalcopyrite; *Fe – Zn* – pyrite, blende; *Cd – Ag* – blende, argentite; *Ag – In* – argentite, fade ores; *In – Sn* – blende; *Sb – Te* – fade ores; *Au – Tl*; *Pb – Tl* – galenite; *Ga – Ge* – feldspars and many other pairs of elements.

Some of the specified pairs of elements can be observed in pentlandite and chalcopyrite presented in form of fractal-dendrite occurred in result of nuclear dissociation of massive protonucleus (Figure 2).

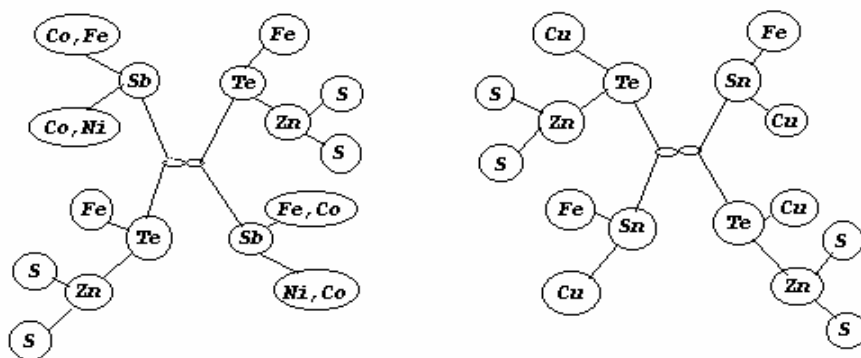


Figure 2. Fractal-dendrites: pentlandite and chalcopyrite.

Experimental method. Figure 2 presents a block scheme of the unit used in the experiments in which metal smelts are influenced by pulse current in magnetic field. The impulse generator was designed and assembled specifically for the experiment based on reversibly switched on dynistors generating microsecond impulses of high amperage currents [5].

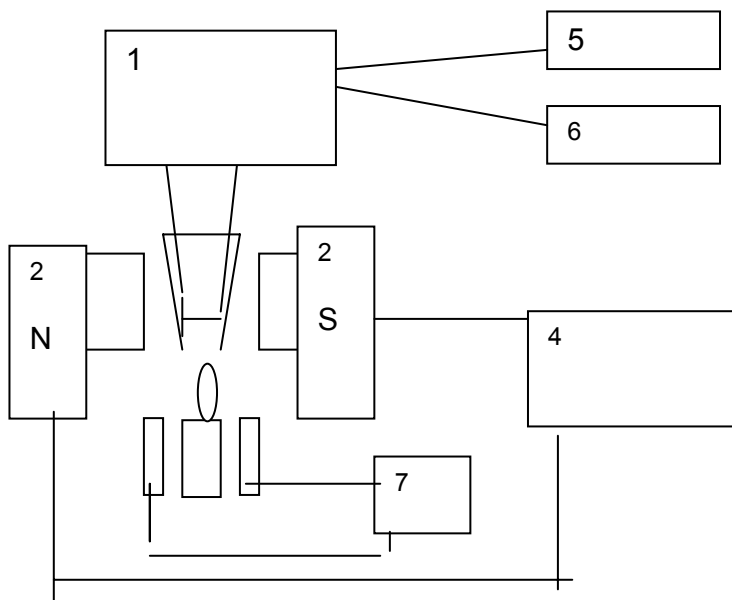


Figure 3.

Block scheme of the experimental unit for metal smelts impulse influencing. The unit consists of the following basic elements: 1. impulse generator; 2. constant magnet; 3. processing chamber; 4. electromagnet power source; 5. oscillograph; 6. frequency indicator; 7. neutrons and gamma-ray emission sensors; 8. gas burner (propane-air).

General characteristics of the unit. $U = 1000V = const$, I change from 0 to 7500A depending on R_m , sinusoid damped oscillation $T_{min} = 25$ microseconds of the first impulse in damped oscillation, frequency of damped impulses from 1 to 400 Hz.

Experiment process. The tested metals were placed into alundum capsule mounted between the poles of constant electromagnet with magnetic field intensity of 1.2 tesla. Metal button consisting of lead HCA, copper OSC and Na_2O_2 HCA in ratio 8:1:1, total weight 270g, was heated up with gas burner to 1100°C during 30 minutes. Then, without cutting off the burner, the smelt was entered by two tungsten electrodes energized with direct current from the impulse generator. Duration of impulse influence was from 60 to 180 sec. Altogether, there were performed 21 tests using impulse influencing the smelt with current.

In course of the tests there was found out that depending on time of influencing the smelt two morphologic kinds of metal are separated after its hardening. The first: there were no visible structural alterations during 60 seconds of influencing the smelt. The second: visible phase transitions and liquation process occurred when the smelt was influenced from 100 to 180 seconds. There were two clear phases. The first – light one when the hardened smelt turns into a microcrystalline discrete mass which then easily disseminates into separate fine crystals with size 0.1–1.0mm. As the further chemical and structural analysis showed, the most significant lead cold dissociation processes are observed in this very phase. The second phase – heavy, malleable one which is similar to a substance condition after a short time influencing with impulse current. The two phases volume ratio is 1:25.

Chemical analysis of the two received samples was carried out using three methods. X-ray dispersive microanalysis using the system AN-10000 (England) with scanning microscope JCM-35CF was performed in the analytical center FGUP VNIITS. X-ray spectrum analysis using x-ray spectrometer PW – 2400 was performed in IGEM RAN by I.A.Roschina. Phase analysis using x-ray spectrum microanalyzer CAMEBAX MICROBEAM was performed by V.G.Senin in GEOCHI RAN. The results of the chemical analyses are shown in Table 2.

Table 2.

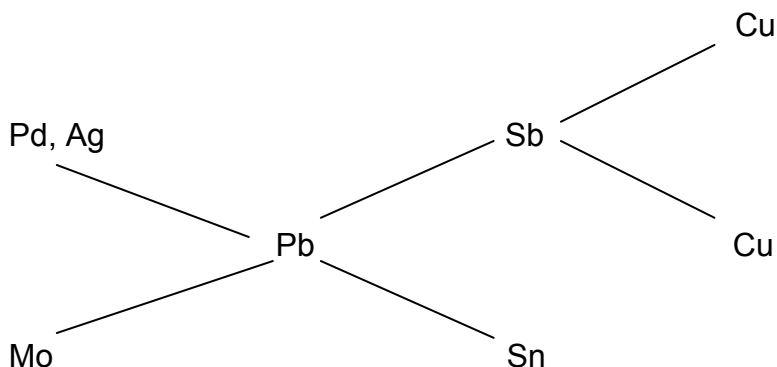
Results of x-ray dispersive and x-ray spectrum analyses.

Test N	Time, condition of influence	Pb	Sb	Sn	Ag	Pd	Mo	Cu	Total
1	60 sec.	74,70	9,30	3,45	0,15	0,70	0,55	11,10	100,0
2	60 sec.	94,00	0,20	0,90	0,10	1,20	0,50	3,10	100,0
3	60 sec.	87,10	2,80	0,70	-,10	0,90	1,50	6,90	100,0
4	60 sec.	89,95	1,70	1,55	0,10	0,70	1,25	4,70	100,0
5	60 sec. In magnetic field	80,90	7,14	1,10	0,27	0,60	1,00	8,94	100,0
6	60 sec. Increased frequency in m.f.	85,00	0,80	0,90	0,20	1,10	1,90	10,20	100,1
7	100 sec. In m.f.	29,00	11,20	0,20	0,10	0,10	0,70	58,40	99,90
8	120 sec. In m.f.	45,69	24,92	3,66	0,00	0,00	0,00	25,73	100,0
9	120 sec. In m.f. main phase	64,90	16,28	3,37	0,05	0,00	0,00	15,46	100,0
10	120 sec. In m.f. light phase	9,47	35,71	5,28	0,10	0,00	0,00	49,54	100,0
11	180 sec. In m.f.	7,14	29,89	5,41	0,05	0,005	0,005	56,47	98,96

As we can see from Table 2, the performed smelts tests with different duration of impulse current influence show a pronounced rising tendency in intensity of nuclear dissociation of lead atomic nuclei. Besides, it is necessary to note that there is an almost direct dependence between the contents of copper and antimony in the received samples. This is characteristic of both various times of influence and the two different phases.

Appealing to the earlier suggested scheme of geochemical chain of element formation [7], it is clearly seen that the received results prove the principle of dichotomy in element formation as a result of nuclear dissociation, that is a consecutive, almost

multiple division of the whole into two parts then another division of each part into two almost equal parts and so on. In case of nuclear dissociation of lead atomic nucleus this division can be schematically presented as follows:



There is one more important fact that must be noted. The showed reaction of nuclear dissociation of lead atomic nucleus has analogies in geochemical processes both in the terrestrial crust and on the lunar surface.

An analog of the suggested reaction in the terrestrial crust is cuprostebit (Cu_2Sb) found in the south of Greenland. Found later in the South Ural cuprostebit is met in coalescence with stitait (Pb, Sn, Sb) – a natural combination of a triple system $Sn - Sb - Pb$ presented by native stannum, antimony and lead [8].

As another analog of the cold transmutation reaction it is possible to name the results received by O.A. Bogatikov et al in examination of lunar regolit delivered by AS “Luna-16” and “Luna-24”. They managed to detect and diagnose micron particles of hard smelt of copper, zinc, gold and silver, as well as aggregates of native molybdenum which had never been observed in nature before [5, 6].

Conclusion

It is well known [7] that the natural geo-transmutation of chemical elements occurs in the atmosphere and earth in the regions of a strong change in geo-, bio-, acoustic-, and electromagnetic fields.

The mineral row materials contain the same accompanying chemical combinations which are independent of mineral deposit [7]. This means that the formation of chemical elements occurs in the same physical and chemical conditions. These conditions were simulated on the fundamental cooperative resonance synchronization principle [1]. The experimental facility was constructed on the basis of our model which provided with the calculated final chemical elements. These

experimental results indicate new possibilities for, simulating, inducing and controlling nuclear reactions by low energy external fields. The borrowing from the geo-transmutation mechanisms of chemical elements creates the fundamental directions in low energy nuclear reaction researches for construction of new ecologically pure mobile sources of energy independent of oil, gas and coal, new substances, and technologies.

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