Fulgurites, Boludes, Volcanoes and Planetary Cores: Do They Have Anything in Common?

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Abstract

As a continuation of the author's hypotheses about iron and sulfur formation in Kolyma fulgurite as a result of LENR-fusion of two $^{28}_{14}Si$ or two $^{16}_{8}O$ nuclei, a common origin mechanism for phosphorus, manganese and titanium was retraced in fulgurites and magmatic spheroids. A manganese nucleus is formed at a fusion of $^{27}_{13}Al$ and $^{28}_{14}Si$ nuclei, and a titanium nucleus at a fusion of two $^{23}_{11}Na$ nuclei. The appearance of nickel isotopes was explained in iron meteorites. On the basis of introduced reactions a hypothesis of planetary cores formation was put forward.

Since the days of schoolday dogma, it is conventional to believe that all diversity of stable chemical elements on the Earth and in the Universe have a stellar origin generated in the remote past and not subjected to any changes since that time. However, an unshakeable conviction that conditions for natural transmutation of elements can be achieved exclusively inside stars has already been in contrast to the experimental facts and natural observations for a long time.

Two papers[1,2] report on research of Kolyma fulgurite formed as a result of a lightning strike in an alluvial argillaceous shale. Metallic spheroids of diameter no more than 3 mm were discovered in it. They occur everywhere in fulgurites and are absent in surrounding rocks. Spheroids consist of Ni-less schreiberzite, alpha iron and troilite; these rare iron-comprising minerals are more specific for extraterrestrial objects. It was noted that troilite has subordinate significance; it is situated in schreiberzite, often on periphery of spheroids. Parts of pebbles, fritted up to slag, contain alpha iron and schreiberzite. The important note: these minerals were not noted by moving away from a central channel. It positively indicates the cause-effect relationship of forming these minerals with lightning discharge.

It should be noted that phosphorus is seldom found in fulgurites in general.[3] In one way or another, the answer still remains to be solved: where do iron, phosphorus and sulfur compounds appear from? This question has not even been discussed. Possible assumption about chemical reduction of iron and rising of its concentration at the cost of sublimation of fusible elements (sulfur and phosphorus) is beneath criticism, as appreciable quantity of these elements is present in metallic spheroids.

The results of two papers[1,2] were checked back and confirmed by another research group[4] from Ekaterinburg (unfortunately, without any references to these papers). They compared the Kolyma fulgurite with the Sikhote-Alin meteorite and concluded that metal particles of the fulgurite have a terrestrial origin.

Fulgurite resembling this composition was described in Riley.[5] It consisted of a great number of tiny iron spheres 0.01 - 0.15 mm in diameter and filaments of metallic iron 0.5 mm in mean length intermixed with a small amount of nonmetallic soil minerals. About 95% of the grains are metallic iron. The nonmetallic mineral grains are all less than 0.1 mm in diameter and were identified as quartz, mica, clay and some feldspar.

Spherical mineral formations of size 0.1 - 1.7 mm from volcanic rocks at Kurile Islands and Kamchatka were investigated by Sandimirova.[6] They have magmatic origin and are connected with plosive volcanism. The spheroids generally consist of native iron and its oxides and also of glass with high content of titanium, iron and manganese. Maximal element contents in various samples are the following:

SiO2,%	FeO,%	TiO_2,%	MnO,%	Al_2O_3,%	Na_2O,%
32.52	30.85	48.15	30.67	8.90	2.38

It was noted that the main problem of spheroid origin remains unresolved up to now.

Spheroidal inclusions of micron size were also revealed in vien quartz of the Kola superdeep borehole.[7] One of them was phosphate and contained 60% P_2O_5, 17% Fe_2O_3 and 8.5% MnO; another one was ferruginous. Native iron also occurred as rounded inclusions of size 0.5 - 1 mm.

In the framework of the hypotheses set forth by the author in *Infinite Energy*,[8] iron-containing minerals in fulgurites are caused by low energy nuclear fusion reactions (LENR). According to these hypotheses, fulgurite iron was synthesized from two silicon atoms of SiO_2 as a result of LENR-chains:

$$^{28}_{14}Si + ^{28}_{14}Si \rightarrow ^{56}_{28}Ni^* + ^{0}_{-1}e \xrightarrow{6\ days} ^{56}_{27}Co^* + ^{0}_{-1}e \xrightarrow{7\ days} ^{56}_{26}Fe + 10.917\ MeV \quad (1)$$

(Here and further the energy release was calculated using nucleus ground and isomeric state parameters.[9]) Fusion of two residual oxygen atoms in SiO_2 yields one sulfur atom:

$$^{16}_{8}O + ^{16}_{8}O \rightarrow ^{32}_{16}S + 16.541\ MeV \quad (2)$$

As a result of these LENR two SiO_2 molecules are converted into one iron atom and two sulfur atoms releasing overall excess energy of about 44 MeV. This guess is indirectly confirmed by the presence of considerable sulfur quantity in troilite of fulgurites; it makes sense to regard troilite itself as a product of LENR Reactions 1 and 2.

But at this point the process does not finish. At the moment of its formation, a sulfur atom can eject a proton and turn into a phosphorus atom:

$$^{32}_{16}S \rightarrow ^{32}_{15}P + ^{1}_{1}p - 8.864 \text{ MeV} \qquad (3)$$

Regardless of heat-absorbing balance of this reaction the general energetic balance of Reactions 2 and 3 is positive:

$$^{16}_{8}O + ^{16}_{8}O \rightarrow ^{32}_{16}S \rightarrow ^{31}_{15}P + ^{1}_{1}p + 7.677 \text{ MeV} \qquad (4)$$

In this way there comes into existence shreibersite, alpha iron and also phosphorus oxide.

Shreibersite in Kolyma fulgurite does not contain nickel. Nevertheless, its absence does not mean prohibition on its appearance, as far as meteorites contain nickel. How does nickel appear in meteorite shreibersite? Together with ^{28}Si another two silicon isotopes ^{29}Si and ^{30}Si take part:

$$2\ ^{29}_{14}Si \rightarrow ^{58}_{28}Ni + 16.437 \text{ MeV} \qquad (5)$$

$$^{28}_{14}Si + ^{30}_{14}Si \rightarrow ^{58}_{28}Ni + 14.301 \text{ MeV} \qquad (6)$$

$$2\ ^{30}_{14}Si \rightarrow ^{60}_{28}Ni + 15.606 \text{ MeV} \qquad (7)$$

As a result of nuclear fusion these isotopes turn into stable isotopes ^{58}Ni and ^{60}Ni. In view of the well-known data about the abundance of Si isotopes on the Earth[9] (^{28}Si – 92.230%, ^{29}Si – 4.683%, ^{30}Si – 3.087%) and in the context of assumption about an inessential difference of this abundance in meteorites, the most likely expected is Reaction 1 and the least likely expected are Reactions 5-7. In meteorites these reactions can occur during their movement through atmosphere[10] and also at lightning discharges in asteroids and comet cores.[11] Absence of nickel in Kolyma fulgurite can be caused by: Reactions 5-7 cannot take place due to unsuitable conditions for them; otherwise isotopic composition of silicon in the point of a lightning strike was depleted by isotopes ^{29}Si and ^{30}Si.

There is more to it than that. The Cook article[12] describes a manganese fulgurite consisting of the following:

Silica (SiO_2), %	42.08
Iron and aluminum ($Fe_2O_3 + Al_2O_3$), %	6.70
Manganese dioxide (MnO_2), %	48.30

In the restricted area of an acre of land in Nebraska there were 30 or 40 of these manganese fulgurites. There were no manganese deposits in that place; fulgurites occurred in the hard, tough, fine-grained, argillaceous sand-rock, to a depth exceeding three feet.

It is reasonable to assume that the record concentration of manganese could only appear as a result of nuclear fusion of aluminum and silicon:

$$\begin{aligned} &^{27}_{13}Al + ^{28}_{14}Si \rightarrow ^{55}_{27}Co^* \\ &^{55}_{27}Co^* + ^{0}_{-1}e \xrightarrow{17.55 \text{ hours}} ^{55}_{26}Fe^* \\ &^{55}_{26}Fe^* + ^{0}_{-1}e \xrightarrow{2.737 \text{ years}} ^{55}_{25}Mn + 17.999 \text{ MeV} \end{aligned} \qquad (8)$$

Fusion of $^{27}_{13}Al$ and $^{28}_{14}Si$ nuclei occurs in three stages. Initially the radioactive isotope $^{55}_{27}Co^*$ is generated (half-decay period is 17.55 hours). It turns by electron capture into a radioactive isotope $^{55}_{26}Fe^*$ (half-decay period is 2.737 years). An atom $^{55}_{26}Fe^*$, in its turn, also executes an electron capture and finally turns into the single stable $^{55}_{25}Mn$ isotope. Thus, aluminum and silicon are in this argillaceous sand-rock not by accident; they play a major part in manganese and iron formation. This allows hope for prospective use of Reaction 8 in direct manganese production without exploration of deposits.

Alongside that, an additional possible mechanism of iron formation in the mentioned fulgurite can be proposed besides Reaction 1. This is direct fusion of two atoms of aluminum:

$$2\ ^{27}_{13}Al \rightarrow ^{54}_{26}Fe + 21.86 \text{ MeV} \qquad (9)$$

It should be noted that a common mechanism of metallic spheroid appearance in fulgurites and volcanic rocks is traced; volcanic eruptions quite often are accompanied by lightning, and in both cases high pressures and temperatures take action. Thus, there can be reasonably proposed a similar appearance scenario (Reaction 8) of manganese compounds.[6,7,12]

One can also explain titanium appearance in magmatic spheroids.[6] It is caused by direct fusion of two nuclei $^{23}_{11}Na$:

$$^{23}_{11}Na + ^{23}_{11}Na \rightarrow ^{46}_{22}Ti + 25.063 \text{ MeV} \qquad (10)$$

The natural abundance of the stable isotope $^{46}_{22}Ti$ is 8.25%. Thus, if by a mass spectrometry analysis one can succeed in ascertaining a significant excess above this value, the LENR origin of spheroids can be proved.

It turns out that products of Reactions 8-10 were already experimentally observed by Prof. Valery Krymsky.[16] After a short duration of exposure by nanosecond electromagnetic pulses to aluminum, zinc and slaggy liquid melts with impurities of silicon and sodium, he discovered the unexpected threefold rise of manganese concentration and twofold rise of Fe- and TiO_2-concentrations. Krymsky also apparently was the first to assume Reaction 9 [Formula 5.15 in Krymsky[16]].

The described understanding of the origin of iron, phosphorus, sulfur and manganese in fulgurites enables us to put forward an alternative hypothesis of forming metallic cores at all planets of the terrestrial group, at the Moon and also at Jovian satellites Io, Europa and Ganymede. The resulting structure of most terrestrial planetary bodies is believed to have a metallic core at its center surrounded by a silicate mantle. Mercurial core occupies 70% of planetary mass,[13] Venusian – 25%, Earth – 32%, Martian – 12%, Moon – 1%. Presence of metallic cores is even assumed at some asteroids as small as 25 km in radius.[14] An impressive spread of aforementioned values suggests that iron in these cores was synthesized (and, perhaps, is synthesized) from silicon as a result of several LENR (Reaction 1). Such guess arises from presence of light elements (potassium and sulfur) on the surface of Mercury, which eliminates the hypothesis about their evaporation under a catastrophic impact with this planet.[13]

There are (or there were in the past) all conditions for behavior of LENR[10] in planetary interiors: high pressure, temperature and density of electric current carried by negative charges (as is known, most of the Earth's lightnings bear just a negative charge[15] and the total electric charge of the Earth has a negative sign). The energy release of Reactions 1-4 is quite capable of providing a significant heating of terrestrial planets without involving doubtful ideas about heating either due to radioactive decay or at the expense of exceedingly slow cooling-down of a planet incandescent in the remote past.

Sizeable release of sulfur and sulfur dioxide gas either directly at volcanic eruptions or as a result of volcanic activity in the immediate past also serve as additional signs of LENR behavior in the Earth's interior. Really, the existence of precipitated sulfur and sulfuric lakes at different places on the Earth are in rather poor agreement with notions about moderate mean concentration of this element in the Earth's crust (about 0.05%), but find the natural explanation in the framework of Reaction 2. Sulfur lakes and sulfur eruptions on the small Jovian satellite Io[8] serve the most bright, almost phantasmagoric, example of indirect corroboration for this reaction. Such tremendous amount of sulfur does not fit in any reasonable explanation except LENR.

The role of sulfur and phosphorus has been experimentally investigated[14] in probable formation and evolution of magmatic iron meteorites which are believed to be pieces of metallic cores of asteroid-sized bodies.

Among LENR there were the burst of Chelyabinsk meteorite equal to 0.44 Mt TNT,[10] and also Tunguska phenomenon (10-15 Mt). The author found himself not alone in this point of view of the mentioned events. Deceased researcher Alexey Zolotov arrived at a conclusion that the burst of Tunguska cosmic body did not happen due to its kinetic energy as was regarded previously, but occurred at the expense of great concentration of its internal energy in a small volume and there exists strong probability that this burst might have a nuclear nature.[17]

Such conclusion is sustained not only by Tunguska and Chelyabinsk events but also by recent burst of Michigan bolide.[18] This six-foot-wide space rock entered the Earth's atmosphere at a velocity of 16 km/c and exploded in the sky with the released energy of about 10 tons of TNT. The blast wave felt at ground level was equivalent to a 2.0 magnitude earthquake, whereas the bolide's estimated kinetic energy, if one accepted its density as 3200 kg/m^3 (chondrite's density), was $1.3 \cdot 10^{12}$ J or 313 Mt TNT. Therefore, mass and velocity are not critical parameters for possibility of instant burst and admit variations in a wide range, *i.e.* bolides, one would think, must explode more frequently, since ballistic waves, supposedly responsible for a burst, always accompany them. Really it does not occur this way and this definitely indicates the correctness of Zolotov's views.

Thus, the examples presented, which have at first sight little in common, reveal quite a lot of similarities that enable us to join them and plausibly explain a picture of natural LENR. That is why the question in the title of this paper becomes ever more rhetorical. Captivating perspectives of these reactions promise vast possibilities which, at rational use of them in the near future, might help to solve many problems of civilization.

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