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PFO–CFO Hypothesis of Solar System Formation: the presolar star as the only source of chemical elements for the Solar System

E.A. Kadyshevich (1) and V.E. Ostrovskii (2)

(1) Obukhov Institute of Atmospheric Physics RAS, Moscow, Russia (kadyshevich@mail.ru), (2) Karpov Institute of Physical Chemistry, Moscow, Russia (vostrov@cc.nifhi.ac.ru)

Abstract

According to the PFO–CFO Hypothesis of Solar System (SS) Formation [1, 2], the stellar radiation zone (RZ) contains an unstructured neutron (n_0) – proton (p_0) substance. Stars emit pico-drops (p-ds) of this substance from the RZ-bottom layer into the space with protuberances and, under a definite critical condition, with the imploded RZ material. The n_0/p_0 ratios of these p-ds increase in time. The nonradioactive p-ds transform into stable atoms right away, radioactive ones do this as a result of radioactive decays. All chemical isotopes of the SS are formed by this mechanism from the presolar star substance. This process is detailed in [2] and in another presentation of these authors. Here: (1) the sequences of transformations of radioactive p-ds from the moments of their emissions to formation of stable atoms are studied, and the p vs. n_0/p_0 dependence for 160 isotopes of 60 elements is plotted; for this aim, the available Tables [3] that give the potential parental nuclides for each known isotope and characteristics of each radiation-chemical decay are used; (2) the Fraunhofer lines and SOHO measurements characterizing the photospheric gas and solar wind compositions, respectively, are generalized and the data are also plotted as p vs. n_0/p_0. The results confirm the PFO–CFO Hypothesis and force us to conclude that the Sun lived more than 90% of its life and that, in the astronomic time scale, the harmful radiation zone destruction is not far off.

1. Introduction

The standard solar model (SSM) is incapable of solid and consistent explaining a number of old-established events, processes, and phenomena observable in the solar vicinities and Solar System (SS) as a whole [2]. For almost a century, no direct proof even for the fusion-reaction occurrence in the Sun was obtained. The extension of the SSM basis and of the traditional approaches to calculations of the stellar masses and rates led to notions on the occurrence of a dark matter advertised in science-fiction books but not identified in the real Universe in spite of the intensive many-decade search. At present, the question, whether this mysterious object is real or is the nonsense obtained as a result of calculations performed on the basis of mistaken values of the stellar masses and rates, is not unfounded. Dark matter is not a unique phantom of such a kind. On the other hand, Bok globules wait more than 50 years for any definite place in the hierarchy of the celestial phenomena. At unexampled development of the instrumentation and space technique, insolubility of such principal universal problems as the dark matter, black holes, and Bok globules for two generations of researchers and the absence of any common clear explanation for a number of the SS paradoxes and unreciprocated questions numerated, for example, in [2], actualize doubts about reality of such principal things as the constancy of the gravitation constant out of the SS and Eddington's ideas on the nature of the stellar processes. The PFO–CFO hypothesis is far beyond the scope of Eddington's notions and leaves the question on the gravitation numerical literal to be open. According to it, just the presolar star was the only SS parent. We study the presolar-star transformations through reflective analyses of the present solar observations and available data on the possible radiation-chemical processes of formation of stable elements. The allowed directions of these processes are independent of the object where they proceed. Thus, we can make conclusions with regard to the presolar-star transformations and also to the further solar transformations.

2. The mechanism of formation of chemical elements

The PFO–CFO Hypothesis is detailed in another abstract. According to it, all elements were formed from the p-ds emitted by the presolar star. The degree of the star-substance neutronization increased in time, and, thus, the emitted p-ds had ever-increasing initial n_0/p_0 values. The nonradioactive drops did not change their n_0/p_0 values. The radioactive drops change their n_0/p_0 as a result of decays. These decays could change the element nature, i.e., the p number in any atom. Figure 1 gives the p vs. n_0/p_0 dependence for about 160 stable isotopes of 60 elements obtained from the radioactive and nonradioactive p-ds.

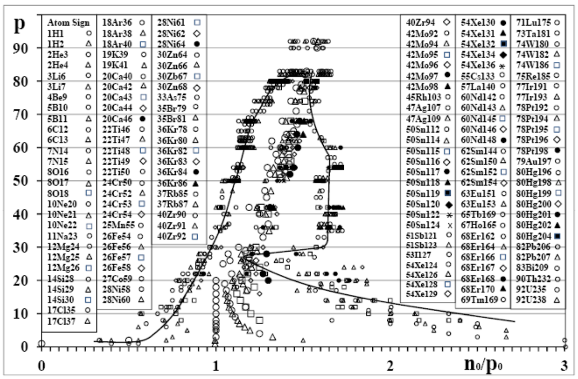

Figure 1: The number of protons (p) in the newly formed stable atoms of the isotopes listed in the figure field *vs*. the (n_0/p_0) ratio in the parental radioactive (small signs) and nonradioactive (large signs) p-ds emitted from the presolar star in different periods of its element-bearing activity.

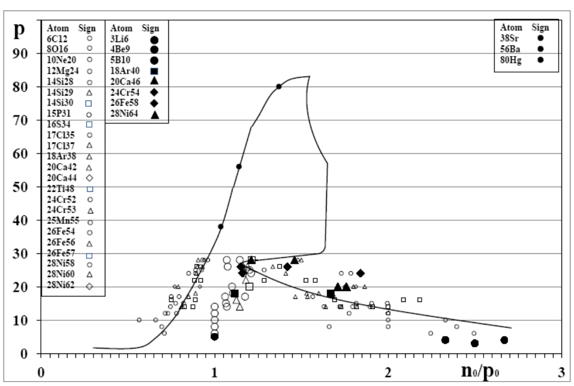

Figure 2: The curve from Fig. 1 with the following data arranged around it: (1) light signs relate to the isotopes discovered in the solar wind by the SOHO Mission, produced from radioactive (small signs) and nonradioactive (large signs) p-ds, and listed in the figure-field left column [4]; (2) black large signs relate to the isotopes atoms of which lie in the same ordinate range, but are absent, according to the SOHO Mission, in the solar wind; (3) black small signs relate to the atoms discovered by analyzing the Fraunhofer spectra [5].

Figure 2 contains a duplicate of the curve presented in Fig. 1 and the points calculated by us for the isotopes discovered by the SOHO Mission ($3 \leq p \leq 28$), for the isotopes atoms of which lie in the same ordinate range, but are absent in the solar wind, and for the atoms discovered in the solar photosphere by analyzing the Fraunhofer spectra. Briefly, we interpret the Fig. 1 and Fig. 2 data as follows. In the star-life main period, the protuberances, being more and more powerful, emit isotopes with $0.5<p<1.4$. Then, the jets are enriched with Th, U, and trans-uranides. At $(n_0/p_0) \approx 1.5$, the RZ explosive destruction proceeds and different isotopes form at almost constant n_0/p_0 ratio. After that, a period of instability follows; the major portion of the destroyed RZ falls back to the star, the star returns to its initial (or almost initial) state, and its new life begins. A small portion of its substance rests in its vicinities as a memory on its regeneration and gives the material for the new Stellar System. If the interpretation of the Frounhofer lines and our concept of the SS formation are correct, Fig. 2 shows that, at present, the elements emitted by the Sun have n_0/p_0 up to 1.35. Meanwhile, Fig. 2 contains an indirect confirmation of our concept: the SOHO Mission found in the Solar wind none of the eight isotopes (Li^6, Be^9, B^{10}, Ar^{40}, Ca^{46}, Cr^{54}, Fe^{58}, and Ni^{64}) which, according to our concept, should be formed only after the RZ explosive destruction.

References

[1] Ostrovskii, V.E. and Kadyshevich, E.A.: The PFO–CFO hypothesis of Solar System Formation: the presolar star explosion mechanism, EPSC Abstracts, Vol. 7, EPSC2012-101, 2012.

[2] Kadyshevich, E.A. and Ostrovskii, V.E.: Development of the PFO–CFO hypothesis of Solar System formation: Why do the celestial objects have different isotopic ratios for some chemical elements?, Advances in Plasma Astrophysics, Proceedings IAU Symposium No. 274, 2010, IAU, Cambridge, UK, pp. 95–101, 2011.

[3] Barbalace, K.L.: http://environmentalchemistry.com/yogi/periodic/

[4] http://sohowww.nascom.nasa.gov/gallery/Particle/cel001. html

[5] Jenkins, F.A. and White, H.E.: Fundamentals of Optics (4th ed.), McGraw-Hill, p. 18, ISBN 0072561912, 1981.