EPSC Abstracts
Vol. 8, EPSC2013-145, 2013
European Planetary Science Congress 2013
© Author(s) 2013

PFO–CFO Hypothesis of Solar System formation: the notion of the Sun-like stars and their transformations

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

Abstract

The stars are considered as the energy/mass space knots, where energy converses into matter; all isotopes form by a unique mechanism outside stellar bodies on the basis of pico-drops of their substance as a result of exothermal radiation-chemical reactions.

1. Introduction

The notion that just fusion reactions provide the existence of stars and that, nevertheless, the processes that proceed in stars are describable by the perfect gas laws exists not because this notion is realistic, but because no other more or less realistic notion is available. For almost a century, no direct proof for the occurrence of fusion reactions within stars was obtained. Detection of neutrinos of celestial origin is the only fact that may be presented as a confirmation of the fusion nature of stellar processes. However, neutrinos can result not only from fusion reactions but also from radioactive decays.

The results of the Solar System (SS) observations lead to some paradoxes and require answers to a number of principal questions [1]; in the framework of the present notions, some celestial phenomena cannot be explained (e.g., the Bok globules) or have very complicated explanations of low probability (e.g., formation of chemical elements).

The extension of the notions about the fusion nature of stars and about the universality of the gravitation constant value beyond the SS led to conclusions on the occurrence of a dark matter and black holes advertised in science-fiction books but not identified in the real Universe in spite of the intensive many-decade search with ground-based and space observing systems. At present, the question whether these mysterious objects are real or are the nonsense obtained as a result of calculations performed on the basis of questionable assumptions of almost hundred years' prescription is not unfounded.

2. The Sun and presolar-star nature and transformations

The PFO–CFO Hypothesis proposes a principally new vision of the stellar nature. In 2010 [2], we first proposed the following SS-formation history. No fusion reactions proceed within stars. Just the presolar star was the unique source of the SS; all isotopes of the SS appeared out of the presolar star radiation zone (RZ) from nonradioactive and radioactive pico-drops (p-ds) through structuring of the former and radioactive decays of the latter. The presolar star was almost identical to the Sun, and the presolar star history was identical to the solar past and future history. The PFO–CFO Hypothesis was developed in [1, 3–5].

In relativistic physics, in the system of units in which a body is static, the body energy is uniquely determined by its invariant mass; therewith, the notion of matter is not adequate to the notion of mass. Whereas mass and energy obey the conservation law and cannot be changed within a closed system, matter may disappear by conversion into energy and may appear from energy. The transformations of matter are associated with no change in the energy of the system because matter contains a quantity of energy that evolves at the matter disappearance and absorbs at the matter appearance. This logistic follows from the special relativity, and it is proved experimentally that matter may transform into energy and vice versa, and that, therewith, the equal invariant mass (m) and rest energy (E_0) quantities appear and disappear according to the equation $E_0 = c^2m$, where c is the speed of light. But if these fundamental processes may proceed on an experimental scale, it would appear reasonable that similar processes should proceed in nature on the universe scale. Moreover, in our opinion, it is logical to assume that the processes of such a kind proceed in the space continuously in both directions and are balanced over the Universe. We assume that stars represent knots in the space filled with energy/mass substance and that such

processes proceed just within the stars; therewith, the processes of the matter appearance/disappearance interchange after achieving definite critical states and proceed repeatedly for a very long time if not eternally between the states of minimum and maximum contents of matter. This is the first fundamental assumption of the PFO-CFO Hypothesis. The second fundamental assumption of our hypothesis is as follows: each star represents, at least, as a rule, a closed system independent or almost independent of other stellar systems, no fusion reactions proceed within the stars, and atoms of all chemical isotopes originate as a result of radiation-chemical reactions by a unique mechanism outside stellar bodies on the basis of p-ds of their substance. Consider the mechanism of the presolar star transformations in more details, starting from the state when the star contained matter almost not at all.

In such a state, the star represents amorphous, neutral, unstructured substance, which transforms in time under gravitation, thermal ionization (TI), buoyancy force (BF), and neutronization. When the gravitation pressing in the stellar center becomes critical, the TI starts there, is accompanied with a positive charging of the stellar substance, and progresses in time along the radii. The electrons (ēs) float up under the buoyancy force, and a ē-enriched layer segregates the core from the radiation zone (RZ). After that, the core and RZ transform almost independently and their rotation speeds are unequal because of the ē-pillow between them. Steadily, gravitational pressing leads to RZ ionization and its positive charging that starts at the RZ bottom and progresses outward along the stellar radii. As a result of ē-pressure increasing, the direction of the process at the RZ bottom reverses, the ionization replaces by neutronization, and the n_0/p_0 ratio at the RZ bottom begins to increase in time. The neutronization of RZ accelerates its densification. Because of slowness of the neutronization process as compared with the core ionization, ē-gas pressure from time to time reaches a critical value, and series of protuberances overcome the RZ backpressure and emit the ē-gas outside together with the p-ds of the RZ bottom substance. The periodicity of the protuberance series varied from epoch to epoch; at present it is about eleven years. The ē-jets initiated the peaks of the stellar magnetic moments, and the p-ds transformed into atoms of isotopes. Depending on the n_0/p_0 ratio, the p-ds were nonradioactive or radioactive [4]. The former gave atoms as a result of structurization, the latter did this after a series of radioactive decays. The radioactive decays warmed up the atoms and gave them an additional moment. Therefore, the farther flied the radioactive atoms away to the corona, the greater were their moments and the higher were their temperatures; increasing in the temperature and moment of the p-ds proceeded up to their transformation into stable atoms. Note that analogous phenomena explain the high temperature of the solar corona; finally, just such atoms and the atoms of the destroyed presolar-star RZ (see below) formed the Solar System, and, thus, their histories explain also the great summarized planetary moment as compared with the solar one. The ē-inflow into the ē-enriched layer of the sun-like stars leads finally to the RZ explosive destruction. According to [4], such events proceed at $(n_0/p_0) \approx 1.5$. They lead to the emission of a great amount of radioactive material from stars and to its radioactive decay in a rather large volume of the space with evolution of energy. In our opinion, just the phenomena of such a kind are usually interpreting as the supernova.

3. Summary and Conclusions

Our hypothesis opens the most realistic sequence of events capable of being repeated with any star of the Universe without involvement of additional objects. This sequence is simple, and it is most probable because «Nature is simple and does not luxuriate in excesses» (I. Newton, «Principia»). Young stars are cold, and the Bok globules are the young stars.

References

[1] 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? Adv. Plasma Astrophys., Proc. IAU Symp.274, 2010, Cambr., UK, pp. 95–101, 2011.

[2]–[4] Kadyshevich, E.A. and Ostrovskii, V.E.: Oxygen isotopic anomalies in the rocks of celestial objects: Are they the key to the planet formation mechanism? EPSC Abstracts Vol. 5, EPSC2010-3, 2010; Formation of planetary systems around Sun-like stars (the advanced PFO–CFO hypothesis) EPSC Abstracts, Vol. 6, EPSC-DPS2011-314, 2011; PFO–CFO Hypothesis of Solar System Formation: the presolar star as the only source of chemical elements for the Solar System, EPSC Abstracts, Vol. 8, EPSC2013-38, 2013.

[5] 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.