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TRANSLATED into ENGLISH by:
the authors

Proterozoic (2.567 billion years ago) and Phanerozoic (567 million years ago), occurred in the arm IV. Less significant events occurred at the borders of Archean (3.567 billion years ago) and Mesoproterozoic (1.567 billion years ago) in the arm II, and events of even less significance at the borders of Mesoarchean (3.067 billion years ago) and Neoproterozoic (1.067 billion years ago) in the arm III. While in hand I, according to geological data, there was not a single mega-event in Precambrian.

Conclusions. The results of this article indicate that the construction of an adequate spiral model of the Galaxy requires compulsory integration of the results of astronomical observations with data from geology and meteoritics. Such integration allows:

- discover existence in Galaxy of two previously unknown jet streams;
- clarify Sun's distance to Galaxy center, and also determine the Galaxy rotation speed;
- prove that Galaxy structure and its rotation speed have not changed since of the Solar system formation;
- to establish that logarithmic arms in our Galaxy are not identical. The main events in history of the Solar system associated with the Sun and planets formation occurred in the arm IV (Crux-Scutum) whereas events of less geological significance in arm II (Perseus) and arm III (Norma).

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Bezmen N.I.[1], Gorbachev P.N.[1], Zinov’eva N.G.[2] Experimental modeling of the chondritic structure.

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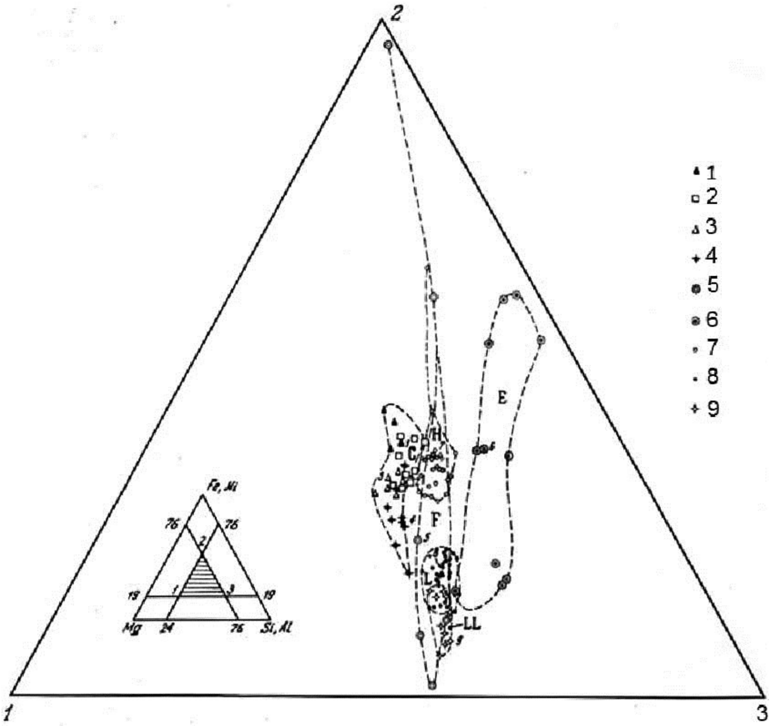
Abstract. The chondritic structure was experimentally obtained with the example of forsterite meteorites, which formed as a result of the interaction of oxides mixture and gas components at 1250°C and a pressure of 50 MPa. The starting composition of the runs corresponded cosmic abundance of the elements. The composition of the fluid phase (C-O-H-S system) was controlled by three independent parameters: mole fraction of hydrogen, the presence of atomic carbon (crucible with the initial sample), and the fugacity of sulfur in equilibrium of the sulphide melt with iron. The composition of the fluid phase at 1250 °C and 50 MPa was calculated using a special program. The presence of hydrogen in the melts leads to the rupture of Si-O-Si bridging bonds in the silicon-oxygen anions, with a part of silicon in fluid-saturated melts become a state of modifiers which cause the formation of glasses as the forsterite composition chondrules during quenching.

Keywords: *Experiment, meteorites, cosmic abundance, chondritic structure, red-ox conditions.*

Introduction. The chondrites form a compact group of meteorites in which MgO, SiO_2 and Fe (±FeO) play an equally important role, while the remaining elements belong to secondary or impurities. According to the composition of petrogenic elements, they approach the composition of the Sun, i.e. to cosmic abundance. With the exception of carbonaceous chondrites, there are no fluid components in them, the presence of which during their formation is fixed in minerals in the form of gas inclusions. Structurally, the chondrites consist of glassy chondrules placed in a finely granular matrix. They are divided into equilibrium and nonequilibrium chondrites by the ratio of glass and crystals. Chondrules are depleted in iron, nickel, carbon and differ from the total composition of chondrites and correspond to the achondrites chemistry. A fragment of the diagram Mg- (Si + Al) - (Fe + Ni) with a comparison of the compositions of chondrites of various types is shown on the figure:



1-4 - carbonaceous: 1-C1, 2-C2, 3-C3 (O), ornans type, 4-C3 (V), vigarana type; 5 - F (forsterite); 6 - E (enstatite); 7-9 - ordinary, 7 - H, 8 - L, 9 -LL.

Experimental method. A hydrogen cell for a high-pressure gas vessel was developed on basis of the “Shaw membrane" technique use. It consists of W or Re reactor in the high temperature zone and in the cold zone from the equalizer-separator which separates the internal volume of the cell (120 cm^3) from the external pressure of the argon medium. W and Re do not react with hydrogen and are not permeable to hydrogen. The cell was placed in a vessel of high gas pressure (diameter 50 mm, volume 1.5 l) with internal heating. The mole fraction of hydrogen in the fluid phase was controlled by Ar-H_2 mixtures of purity-specific gases in the hydrogen cell. The experimental procedure is based on the permeability of H_2 through the welded Pt capsule, which was used as a container for the sample.

Argon-hydrogen mixtures, X_{H2} = 0.6, were prepared in a special device, and then were pumped into the reactor at a total pressure of 10.1 MPa. The hydrogen cell was inserted into the heater into a gradientless temperature zone. The temperature gradient was controlled by two independent windings of the heater and determined by two thermocouples placed in a reactor near the reaction capsule. The gradient did not exceed 0.1°C / cm. The thermocouples were calibrated for the melting point of pure gold the accuracy of the temperature determination was ± 5°C. The pressure was measured with an accuracy of ± 5 MPa by a Bourdon manometer. The experiments were quenched by switching off the power supply.

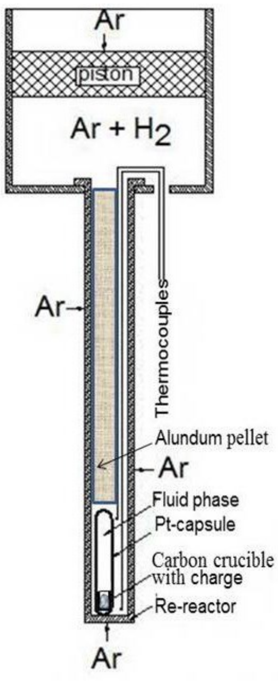
The contents of gases in the H-C-O-S system were controlled by carbon and Fe-FeS association, which always present in meteorites. We used the coupling reactions between gases of different compositions, calculated on the assumption of an ideal mixture of real gases (the Lewis-Rendall rule): $X_{H2} = 0.6$, $X_{H2O} = 0.005$, $X_{CO2} = 0.0$, $X_{CO} = 0.011$, $X_{CH4} = 0.391$, $X_{H2S} = 0.003$, $\log f_{O2} = -15.32$, $\log f_{S2} = -5.6$.

The starting sample corresponding to the cosmic abundances of the elements was prepared from oxides of petrogenic elements, metallic Fe and Ni, sulfur, the amount of carbon was introduced in the form of oxalic acid. The water content corresponded to the calculated oxygen content obtained after weakening its cosmic abundance in the charged oxides. The experiments were held for 168 hours. After the experiment the sample was a column of glass without a noticeable reaction with the graphite crucible, from which polished section was prepared for subsequent analysis on the microprobe.

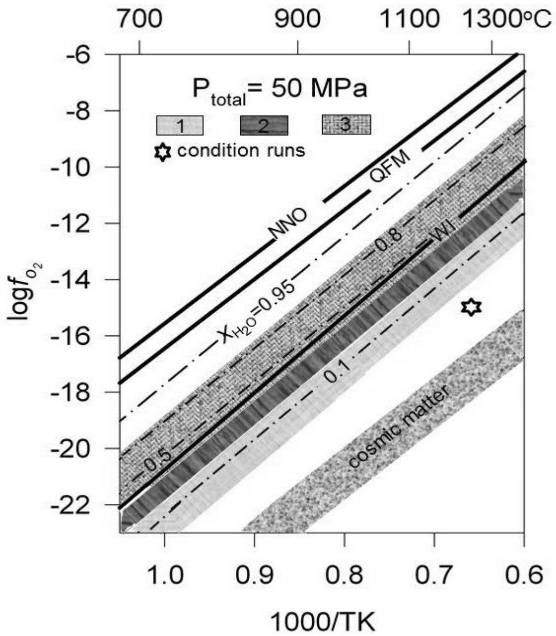
Results of the experiments.

Physico-chemical parameters of formation of chondrites.

Temperature regime of formation of chondrites. Chondrules contain glass or would be crystallized completely. Crystallization temperatures of the chondrules vary considerably. They can be higher than the temperature of incongruent melting of enstatite (1300-1400°C).



There is a reason to believe that the chondrules crystallized before the matrix. The matrix is enriched in iron and sulfur. On the basic of an experimental study of the distribution of Ni between Fe-metal and troilite depending on the temperature (Bezmen et al., 1979) it was found that the minimum temperatures of this association for all chondrites are located near 500°C - 800°C. The results reflect a complex temperature history of differentiation, crystallization and subsequent cooling of the chonrites, during dissipation of fluid components occurred.



Oxidation-reduction conditions for the formation of chondrites. The diagram shows the oxidation-reduction conditions for the formation of chondrites of various types: 1- ordinary chondrites, 2 - carbonaceous chondrites and achondrites, 3-forsterite and enstatite chondrites.

Pressure. Petrological data based on the absence of formed at high pressures minerals show that the crystallization of chondrites took place at low pressures below 500 MPa.

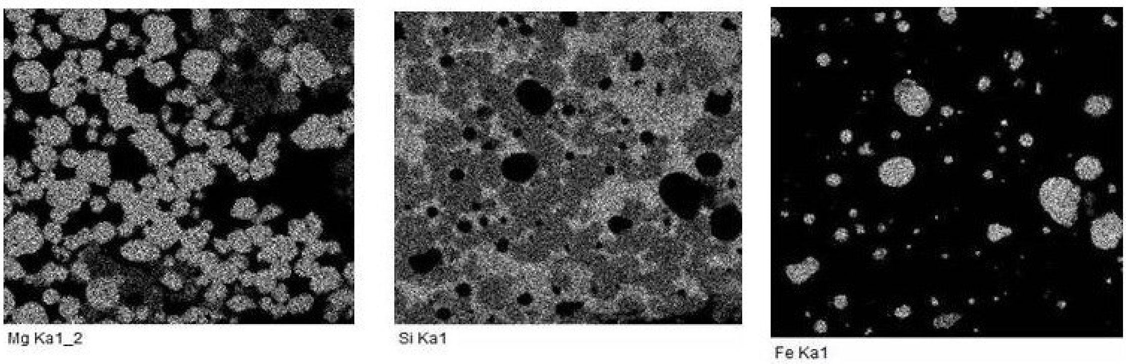
Chondritic structure of meteorites. In previous works (Bezmen et al., 2005; 2011), which based on the analysis of photoelectron spectra of hydrogen-containing aluminosilicate glasses, it was shown that the presence of hydrogen in the melts leads to the rupture of Si-O-Si bridging bonds in the silicon-oxygen anions and the replacement of some oxygen atoms by hydrogen ions the following scheme:

$$\text{- Si-O-Si + H = Si-O + Si-H},$$

with a part of silicon in fluid-saturated melts becomed a state of modifiers which cause the formation of glasses as the forsterite composition chondrules during quenching. Clear interphase boundaries between the chondrules and the matrix indicate the liquid immisibility nature of their relationship.

A fragment of the sample obtained as a result of modeling the chondrite structure at a pressure of 50 MPa and 1250°C in *X*-ray radiation of Kα-Mg, Kα-Si, Kα-Fe (20kV, 20nA) is shown on the figure. The mapping was performed over an area of 200x200 μm^2 with an accumulation time of 100 s.

The physicochemical conditions for the formation of a chondritic structure would arise as a result of the ordinary accretion of cosmic matter in the form of segregations of melts enriched with petrogenic and fluid components, which placed in a predominantly hydrogen-methan gas medium in the early stages of protosun formation, as well as accretion in the planetesimals and in the planets of the protosolar system.



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Demidova S.I.[1], Badekha K.A.[1], Kononkova N.N.[1] **Modelling of P-bearing fayalite crystallization conditions in lunar mare basalts.** UDC 551.14:554.015.4

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Abstract. Rare grains of P-bearing fayalite (< 0.4 wt % P_2O_5) has been recently found in late-stage mesostasis of olivine basaltic fragment in Dhofar 287 lunar meteorite, in Fe-rich rock fragment of Luna-16 soil sample and in two