INVESTIGATION OF THE EXTRACTABLE ORGANIC CONSTITUENTS OF THE KAINSZA CARBONACEOUS CHONDRITE


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INTRODUCTION. Carbonaceous chondrite Kainsaz contains carbon (Cbulk=0.63 wt.) and the extractable organics (0.007 wt.) /1/. Paraffinic hydrocarbons ("n-alkanes" n-C7-n-C24 and isoprenoid hydrocarbons) have been found in the benzene-methanol extracts of this chondrite using the combined gas chromatographic-mass spectrometric analyses /2/. The organic matter can be used as for identification of composition of individual organic compounds as the indicator of the chondrite matter heating degree. For example, Gronin and Moore /3/ have concluded on the basis of composition investigation and correlation of the extractable amino acids in samples of Murchison at various temperatures this chondrite was not heated above 120°C. In our paper we report the results of the organic compositions analysis in samples of Kainsaz chondrite heated at various temperatures. The identification of organic compounds was carried out by infrared spectroscopy and by fluorescence analysis.

EXPERIMENTAL PROCEDURE. 3 samples (.5g) of the Kainsaz silicate phase were used for analysis of the extractable organic constituents. They were placed to glass ampules and sealed after their evacuation at 10⁻³ torr for 1 hr. Two ampules with the samples were heated at 205°C and 345°C for 52 hr. Then all 3 samples were removed from ampules and crushed to approximately 100 μm. Organic constituents of the samples were extracted with 50 ml of a benzene-ethanol-chloroform (1:1:1) mixture for 1 hr. at room temperature with ultrasonically. After solvent evaporation the organic matter was studied by infrared spectroscopy (was used spectrophotometer UR-20 at 400-4000 cm⁻¹) and using quasilinear luminescence spectra of extracts in the hexane-matrix at 77 K (spectra were registered by spectrometer C/20-1 at 400-600 nm). For the infrared spectroscopy analysis of organic (without its previous removing) the 6 samples of chondrite silicate phase were crushed to 100 μm, placed to glass ampules and sealed after their evacuation. Five ampules were heated at 120, 250, 340, 470 and 590°C for 2 hr. After heating suitable for analysis aliquots (~2 mg) were mixed with KBr. The registration conditions were described above.

RESULTS AND DISCUSSION. The infrared absorption spectrum of organic solvent extracts from unheated sample of the Kainsaz chondrite is shown on Fig. 1. The presence of various aliphatic carbon-hydrogen absorption bands in the 2800-3000 cm⁻¹ region of the spectra can be seen. The presence of absorption bands at 1740, 1730 and 1720 cm⁻¹ (valency vibrations of CO group) indicates on a variety of different class organic compounds-ethers, aldegids, ketones, acids and unsaturated compounds. During the heating of the samples the organic matter was altered and at 790°C the most amount of the oxidized organic was lost. The absorption band at 1430 cm⁻¹ maximum appears in infrared spectrum of heated at 250°C sample (Fig. 1). This is evidence of the CO₂ group presence. Probably the organic matter was modified during the heating of samples at first at the expense of decarbonization and then of the pyrolysis and condensation processes. There is the broad intensive luminescence band at the 498 nm maximum in the luminescence spectrum of extract from unheated sample of the Kainsaz chondrite (Fig. 2). This band is apparently due to luminescence of the oxidized high-molecular compounds. In the spectrum there are also structure luminescence bands of the polycyclic aromatic hydrocarbons (PAH)-perylene (445, 452, 473, 479 nm), 3,4-benzoquinone (402, 426, 445 nm), 1,12-benzoperylene (419 nm), phenanthrene (459 nm), coronene (430, 445 nm). Florovskaj et al. /4/ and Vinogradov et al. /5/ had obtained the same organic compounds (PAH) in CM chondrites (Mighei, Cold Bokkeveld, Staroe Boriskino) by fluorescence analysis. The luminescence spectrum patterns of the extracts from heated samples are changed (see Fig. 2). During the heating of sample at 205°C the intensity of the broad band at the 498 nm maximum is decreased. This fact indicates probably on the sample decarbonisation. Two maximum at 440 and 475 nm appear in the luminescence spectrum of the sample heated at 345°C; the intensity of the short-waves part of spectrum is increased, while the intensity of the long-waves part is decreased. Probably all these alterations can indicate on the processes of pyrolysis and condensation of organic compounds. It should be noted that in heated samples of Kainsaz chondrite the new aromatic compounds are formed, identification of which is difficult until. Since the extractable organic compounds from the unheated and heated samples differs distinctly probably the matter of the Kainsaz chondrite was not heated above 350°C after accretion.

REFERENCES.
Fig. 1 Infrared absorption spectra of Kainsaz carbonaceous: 1 - organic extracts of unheated silicate phase, 2 - unheated silicate phase, 3 - silicate phase heated at 250°C.

Fig. 2 The luminescence spectra of Kainsaz chondrites extracts from: 1 - unheated silicate phase (width of the hole 0.08(0.16)), 2 - silicate phase heated at 205°C (width of the hole 0.08 (0.16)), 3 - silicate phase heated at 345°C (width of the hole 0.06 (0.12)).