# COMPLEX RADIATION-THERMAL HISTORY OF KAIDUN METEORITE ON DATA OF TRACK STUDY OF SILICATE MINERALS

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The results of track study of ~80 individual silicate mineral crystals (ol, px, plag) picked out from Kaidun meteorite are presented. A wide range of observed $\rho_{VH}$ value distributions indicate the complex irradiation history of Kaidun minerals. In one anortite crystal having two track groups with different parameters the pre-accretion irradiation traces were observed in all probability.

In the earlier track and thermoluminescense (TL) studies of Kaidun unique heterogeneous breccia /1-3/ we have obtained some TL-parameters and ancient natural track characteristics for the glass fragments (~tens-hundreds μm in size) picked out from the individual glass inclusions in the Kaidun carbonaceous matrix. These data indicate the absence or the very low degree of heating influence and strong heterogenity of track and TL-parameter distributions for the investigated glass samples.

Now we present the results of track study of ~80 individual silicate mineral crystals (ol,px,plag) picked out both from the crushed bulk sample and from Kaidun carbonaceous matrix. The most part of olivine grains (~85%) is characterized by extremely low track density of $\rho \lesssim 10^3$ cm$^{-2}$ (see fig.1), which is caused by uranium fission fragments. The other mineral grain percentages having the same $\rho$ value are lower, from 15 to 70%. Part of crystals (10-60%) with $\rho \simeq 10^4$-$10^5$ cm$^{-2}$ and those with $\rho \gtrsim 10^6$ cm$^{-2}$ are considered to irradiate by low-energy VH-nuclei cosmic rays at the pre-accretion stage. The presence of grains with $\rho > 10^8$ cm$^{-2}$ is characteristic of all minerals (apart from En). Their percentages among total quantity of crystals under study are differents: 6, 10, 15, and 25% for ol, an, ab and Ca-px respectively. Track density gradients were not observed in these crystals. The wide range of $\rho_{VH}$ values (more than 3 orders of magnitude) indicate complex irradiation history of Kaidun minerals. In the fig.1 the $\rho_{VH}$ value distributions for Kaidun glasses are presented for comparison with those in crystals. It can be seen that there are no glass samples having $\rho < 0.4 \cdot 10^5$ cm$^{-2}$. This heterogenity of track characteristics indicate the differences of radiation-thermal conditions for individual grains of tens-hundreds μm in size.

The observation of two track groups in an anorthite crystal with different values of lengths and densities is of particular interest (see Table). This individual anorthite grain was picked out from the black meteorite matrix. It contains the matrix contamination traces on the one of its faces. The I group tracks with higher track densities are characterized by much less lengths as compared to II group tracks. The I group track lengths shortening is caused by heating influence unlike the unannealed II group tracks. We observe the tracks stored during

Table. Characteristics of group I and II tracks in the anorthite crystal K.10.2.11 from Kaidun meteorite.

| Track group | Track number | Track density, $cm^{-2}$ | Track* length intervals, μm |
|---|---|---|---|
| I | 459 | $(1.4+-0.07)\cdot10^{8}$ | 1 - 3 |
| II | 86 | $(2.6+-0.3)\cdot10^{5}$ | 4 - 13 |

* Track lengths were measured on the crystal surface.

two-stage irradiation: 1) the first pre-accretion irradiation stage has taken place very early in the Kaidun breccia formation in all probability; 2) the following second irradiation stage has taken place after I group track annealing.

References. 1. L.L.Kashkarov, N.N.Korotkova et al. XXI, LPSC,1990,p.611. 2. L.L.Kashkarov, N.N.Korotkova et al. XXII LPSC,1991, p.695. 3. L.L.Kashkarov, N.N.Korotkova et al. XXIII LPSC, 1992, p.665.

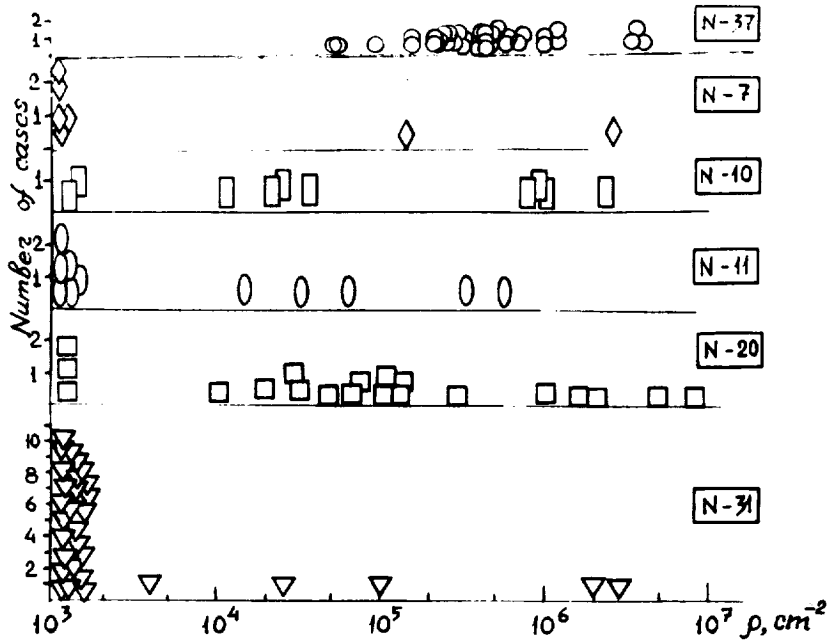


Fig.1. Track density distributions in different mineral phases of Kaidun meteorite: ○ - glass, ◊ - albite, ▯ - anorthite, 0 - enstatite, □ - Ca-px, ▽ - olivine. N is the number of mineral fragments under study.