TRACK INVESTIGATION OF THE ANDREEVKA L3 CHONDRITE.
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A study of tracks formed by nuclei of the iron group of cosmic rays in olivine grains of chondrite Andreevka to search irradiating records obtained during the early stage of solar-system development has been made. The Andreevka meteorite (fall 7 Aug. 1969) is extremely unequilibrated ordinary chondrite of type L3. This meteorite has clear chondritic texture and does not show evidence for shock metamorphism [1]. It contains sharply defined chondrules making up 75 vol.% of whole meteorite. The space between chondrules fill with dark thin grained matrix. The composition of olivine is very heterogeneous. It changes not only from one to another chondrules and grains but even within an individual chondrule and grain [1]. Contents of Fa in olivines vary from Fa 5 to Fa 28.

For polishing, etching and examination convenience the individual grains and fragments of chondrules selected from bulk sample and thin section of 5 mm x 8 mm size were mounted in epoxide resin. The revelation of tracks in olivine was accomplished by etching in boiling WN solution at pH 8 [2] during 12 hours. The observations and measurements of track density (ρ) were carried out with aid of an optical microscope at an ~1000-fold magnification. We have measured track densities in 68 individual olivine crystals and fragments of chondrules from bulk sample of 2 cm x 3 cm x 5 cm size and in olivine crystals from observed in thin section chondrules. Some results of analysis are given in Table 1. We have investigated three chondrules containing the relict olivine crystals which were not crystalized in situ [3]. The most interest represents microporphyritic olivine-pyroxene chondrule (see Fig.1). It contains of large corroded subhedral olivine crystals (Fig.1a) surrounded by thin clear rims. Such olivines were formed either by incompletely melting of fragments of pre-existing materials (rock or primary chondrules) or by entering in plastic state chondrule. The surrounding groundmass contains abundant brown devitrificied glass and fine grained euhedral olivines (Fig.1b) and orthopyroxenes that appear to be of igneous origin.

Measured ρ values in olivines range from $1.1 \cdot 10^6$ to $5.2 \cdot 10^6$ cm^{-2}. This range is roughly the same for crystals from all types observed chondrules: droplet microporphyritic and barred, and lithic microporphyritic and grained These tracks were mainly produced by galactic cosmic rays. Values of ρ in relict crystals (see Fig.1a, and Table 1) are not exceed ρ measured in usual formating in situ crystals. Very high track densities were not founded neither in large number of individual crystals nor in crystals entering in chondrules. Thus we conclude chondrite Andreevka was not irradiated by solar flare during accretion stage of meteorite formation.

References: [1] Osadchii Eu.G.et al.(1982)Meteoritika, 40, p.16(in Russian). [2] Krishnaswami S.et al.(1971)Science 174,p.287.[3]Rambaldi E.R.(1981)Nature 293, N5833, p.558.

Table 1. Measured track densities in olivine crystals

Type of material	Track cm^{-2}; in units of 10^6 track cm^{-2} (No of track measured)
Bulk sample	
Individual crystals	5.2(34); 1.8(25); 2.5(27); 1.8(33); 1.5(22)
	1.5(24); 1.7(34); 3.3(36); 2.9(35); 4.2(51)
	1.4(35); 1.1(33); 2.9(22); 1.3(41); 1.7(26)
Fragments of chondrules	1.2(36); 3.2(67); 3.6(48); 2.1(18); 4.9(32)
Fragments of droplet barred chondrules	3.0(26); 2.0(15); 3.1(17); 2.7(9)
Thin section (5mm x 8mm)	
Barred chondrules	1.7(26); 2.4(10)
Lithic chondrule	1.9(27)
Microporphyritic chondrules	2.4(24); 1.6(16); 2.4(41)
Microporphyritic chondrule *)	relict crystal 1.0(21)
	usual crystal 1.1(18)
Poikilitic chondrule	relict crystal 1.3(10)
	usual crystal 1.2(18)

*) - see Fig.1

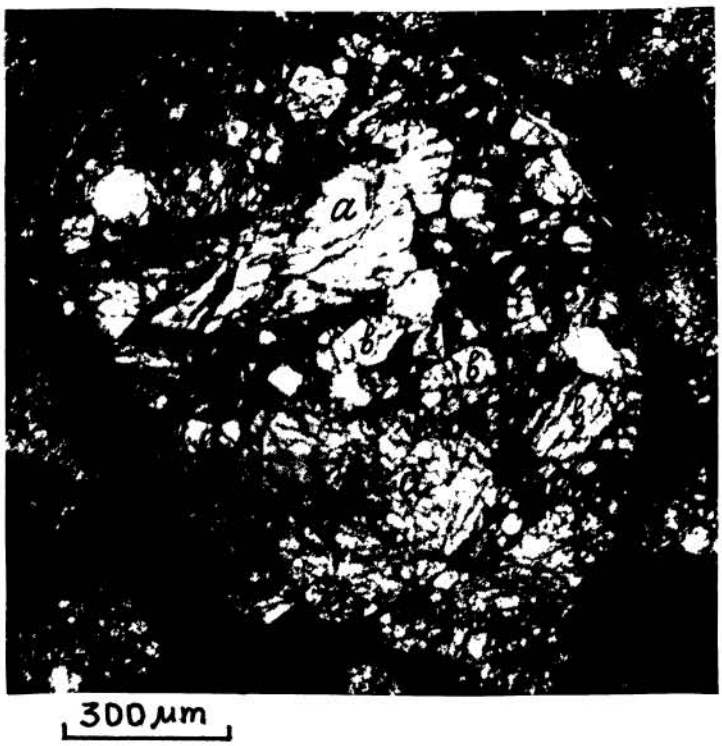

Fig.1. Microporphyritic chondrule, thin section, transmitted light; a - relict olivine crystal; b - usual euhedral olivine crystal.