CHROMITE-RICH CHONDRULES IN THE ORDINARY EQUILIBRATED CHONDRITES AND THEIR POSSIBLE FORMATION. Krot A.N.,* Ivanova M.A.,* Petaev M.I.,* Sidorov Yu.I.,* Kononkova N.N.,** Karataeva N.N.* Vernadsky Ins. Geoch. Anal. Chem., USSR Acad. Sci.,** Moscow States University, Moscow, USSR.

The Elenovka (L5) and the Melnikovo (LL6) are equilibrated ubrecciated ordinary chondrites whithout any features of post impact melting [1-3]. We have investigated microporphyritic Pl-Ol-Chr chondrules which were found in the polished sections of these meteorites. Present report is concerned the results of EPMA and SEM of these chondrules and possible models of their formation.

The chondrules from the Melnikovo are characterized by zonal structure (Fig.1) : right part is composed of subhedral grains of Chr partly or completely involved in Ol or contacted with it; the abundance of Pl mesostasis isn't large. Separate grains of Ol, Chr, Tr embedded in Pl mesostasis form the left part of the chondrule in which the Pl predominate. According to the chemical composition and their position within the chondrule the Chrs are divided into two groups. The Chrs from the right part are very similar to the Chrs from the Melnikovo as a whole [4] and those from the left part differ by the higher contents (wt.%) of Al_2O_3 (12.01), MgO (3.82), and lower Cr_2O_3 (50.84), FeO (28.89), TiO_2 (1.84), V_2O_3 (0.29). The Chrs from the both groups are homogeneous in composition.

The chondrules from the Elenovka (fig.2) is composed of Ol, Chr, Pl and rare grains of Fe,Ni-metal, vitlokite , troilite. The Ols as a rule, are euhedral and characterised by the presence of little (<10 μm) rounded or euhedral inclusions of Fe,Ni. Sometimes rounded grains of Whit are in the contact with Fe,Ni or as separate inclusions in the Ol. The Chr varies in size (1-200 μm) and composition (Table 1) Large subhedral grains(>10 μm) occurs in the intergrowth with Ol or in the Pl mesostasis and sometimes contain the inclusions of Whit. Small euhedral Chrs form law-oriented inclusions in Pl. Based on the chemical compositions and sizes the Chrs may be divided into four groups.(I)-large grains occurring only in Pl mesostasis and having variable compositions differing by relatively high contents of Al, Mg and low Fe, Cr, Ti, V. (II)-small grains contacting with Ol and are very similar to Chrs from the most ordinary equilibrated L chondrites [5]. (III) - intermediate by the size Chrs forming inclusions in Pl mesostasis and having chemical composition similar with the II group Chrs. (IV) - small euhedral Chrs orientated in Pl mesostasis and characterized by slightly higher contents of Mg,Ti,Al in comparison with the II and III group.

We have thermodynamically estimated stability of the chondrule minerals relative to nebula gases and found that Chr and Ol compositions observed might condense under $H_2O/H_2 > 10^{-2}$ in the temperature range 1400-1500 K ($P(tot)=10^{-3}$ atm). Under these conditions Chr and Ol associate with diopside and anortite, which have reacted with Na-rich gas at the temperatures of 1050-1100 K and formed chondrule mesostasis.

Results obtained suggest several ways of the such chondrule formation : 1) the chromites of variable composition are the relict grains survived the melting episodes ; 2) the Chrs were crystallised from a Cr-rich molten droplets; 3) the Chrs are the condensate grains from the gas of unsolar composition [6].The presense of chondrules riched by chromites of variable composition in equilibrated chondrites from the different groups and petrological types [7] may be indicate : 1) the diversity of the chemical composition of the precursor matter ; 2) the lack of thermally metamorphism of the meteorite's parent bodies that would be enough to remove the signs of unequilibrity between the Chr grains [8].

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References: [1] Baryshnikova G.V. et al. Meteoritica, 1979, V.38, p.37 (in Russian); [2] Ivanova M.I. et al. Meteritica, 1988, V.47,p.80 (in Russian) ; [3] Krot A.N. et al. Meteorica, V.50 (in press); [4] Krot A.N. et al. (1991) this volume; [5] Bunch T.E. et al. GCA, 1967,V.31,p.1569; [6] Weinbruch S. et al. Meteoritics, 1990, V.25, p.115; [7] Fudali R.F. Meteoritics, 1975, V.10, p.31; [8] Kurat G. LPSC XVIII, 1987,p.521

Table 1

Chemical compositions of chromites from the Pl-Ol-Chr chondrule of the Elenovka chondrite

Group	N point	Size μm	Contents,wt.% MgO	Al2O3	TiO2	Cr2O3	MnO	FeO	SiO2	V2O3	Σ
	89	205	6.05	20.00	0.98	48.22	0.29	23.99	0.07	0.31	99.91
	79	81	4.64	14.18	1.50	53.12	0.35	25.43	0.00	0.40	99.62
	82	61	4.41	12.96	1.77	54.17	0.08	26.12	0.00	0.28	99.79
I	83	81	3.64	11.22	1.86	55.50	0.24	26.27	0.10	0.59	99.42
	84	55	4.59	10.67	2.00	55.94	0.25	25.75	0.11	0.52	99.83
	81	80	3.00	8.02	2.75	56.82	0.49	27.42	0.00	0.76	99.26
	75	20	3.71	7.38	2.29	58.78	0.57	26.28	0.10	0.69	99.80
	76	41	3.68	6.94	3.08	58.25	0.36	25.94	0.18	0.41	98.84
II	X (10)	14	1.95	5.76	2.89	58.19	0.52	29.40	0.11	0.83	99.65
	σ		0.26	0.40	0.47	0.39	0.07	0.66	0.07	0.09	
III	X (9)	32	2.91	5.58	3.31	58.13	0.43	28.37	0.12	0.85	99.70
	σ		0.41	0.17	0.16	0.45	0.19	0.59	0.06	0.09	
IV	X (6)	<7	4.15	8.62	3.39	54.58	0.36	27.34	0.15	0.50	99.49
	σ		0.24	0.96	0.59	1.46	0.13	0.62	0.09	0.11	

Fig.1. The Pl-Ol-Chr chondrule from the Melnikovo chondrite

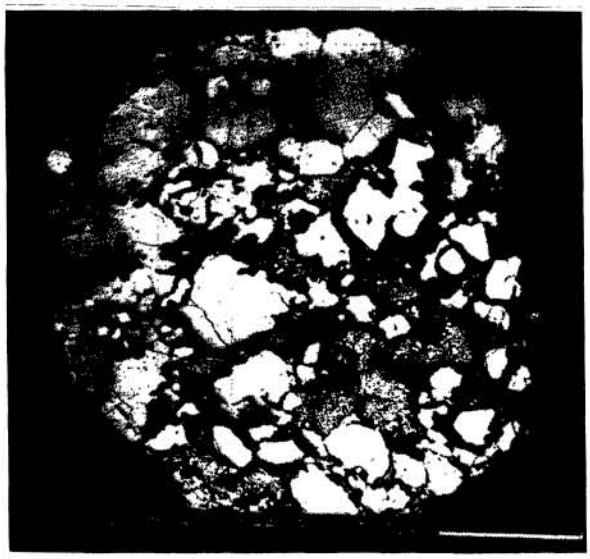

Fig.2. The Pl-Ol-Chr chondrule from the Elenovka chondrite