RELATED COMPOSITIONAL AND CATHODOLUMINESCENCE TRENDS IN CHONDRULES FROM SEMARKONA

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Because of their dependence on mineral composition and texture, cathodoluminescence (CL) properties are very useful in sorting out the variety of chondrule types (1). Here we report on our continuing study of the CL of chondrules from the most primitive ordinary chondrite, Semarkona. We call chondrules which display CL Group A, and those without CL Group B; these groups are not necessarily related to textural types. Group A are subdivided into A1 (yellow CL mesostasis, red CL ol/px) and A2 (yellow CL mesostasis, dull red or non-CL Ol/Px). Table 1 lists the data for the 23 chondrules studied. Group A1 chondrules include type IA and others, A2 are mostly PP, while Group B include type II and others (2).

Normalized INAA data for Group A1 and A2 chondrules show depletions which increase with volatility from Mg to K, whereas group B chondrules show a flat pattern for all lithophiles (Fig. 1). Group A chondrules all have a positive Eu anomaly and a slight enrichment in Yb and Lu, especially in A2, while the anomaly is weak or absent in Group B (Fig. 2). The differences in REE behavior are related to the composition and oxygen fugacity of the different groups; Eu tends to be higher in CaO-rich, low fO_2 melts.

This study demonstrates that the unusual volatile-depletion patterns and Eu enrichments in some Semarkona chondrules are not rare phenomena since Group A chondrules constitute 35% of the chondrules present (4). Such chondrules cut across all textural types. The data appear to suggest that chondrules within Groups A and B are genetically related, but that the two CL groups are fundamentally distinct from each other. These results may be applicable to other type 3 chondrites, since similar CL subdivisions are present, although metamorphism has changed the details.

Table 1.

Chond.	CL Color mesos.	CL Color grains	Text.	Mesos. CaO(%)	Fa	Fs
Group A1						
31-1	yellow	red	POP	16.6	0.6	1.4
23-5	yellow	red	PO	20.0	0.5	--
22-4	yellow	red	PO	18.9	0.5	--
30-6	yellow	red	POP	15.8	0.5	0.8
28-12	yellow	red	BO	17.0	0.8	0.8
2-12	yellow	red	POP	16.6	0.6	2.2
2-8	yellow	red	POP	14.0	0.4	0.8
24-6	yellow	red	--	--	--	--
Group A2						
3-10	yellow	d. red	PP	10.5	--	2.0
26-5	yellow	d. red	PP	9.3	3.3	4.8
20-5	yellow	d. red	PP	12.5	--	3.7
23-18	yellow	d. red	PP	10.8	1.7	2.8
22-10	yellow	none	PP	8.9	7.9	4.0
22-3	yellow	none	PP	10.0	3.5	5.0
23-2	yellow	none	--	--	--	--
23-8	yellow	none	POP	1.6	8.3	8.1
28-1	yellow	none	POP	18.6	20.8	13.8
20-1	yellow	none	BO	10.4	23.2	19.2
Group B						
7-3	none	none	POP	6.4	22.3	12.9
29-11	none	none	PO	0.83	10.3	--
30-5	none	none	POP	2.28	12.8	11.8
22-12	none	none	POP	1.05	15.3	27.8
10-2	none	none	C	--	--	--

Fig. 1

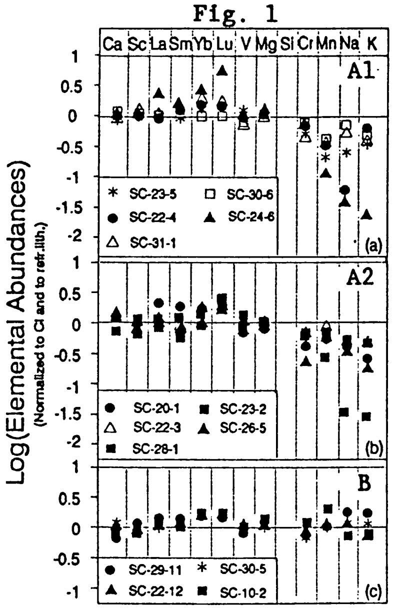
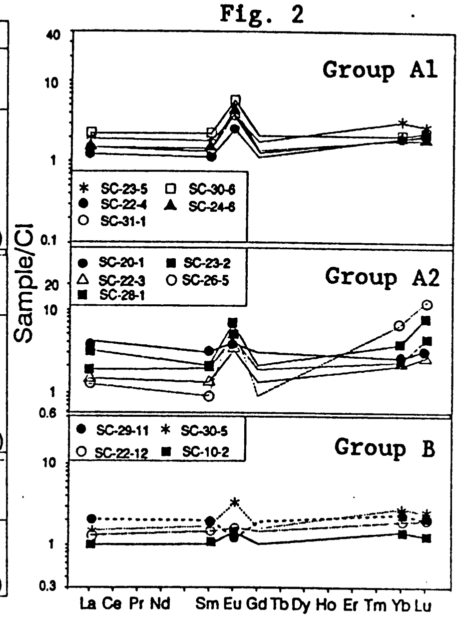


Fig. 2



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