Sears D.W.G., Lu Jie, Benoit P.H., DeHart J.M. and Lofgren G.E. (1991g) A compositional classification scheme for chondrules. *Meteoritics* 26, 393-394.

A compositional classification for chondrules. Derek W. G. Sears,[1] Lu Jie,[1] Paul H. Benoit,[1] John DeHart[2] and Gary E. Lofgren.[2] [1]Cosmochemistry Group, Dept. of Chemistry and Biochemistry, Univ. of Arkansas, Fayetteville, AR 72701, USA. [2]SN-2, NASA Johnson Space Center, Houston, TX 77058, USA.

The existing methods for classifying chondrules are either based on structures, and therefore relatively insensitive to secondary alteration, or they concern fairly homogeneous subsets of the chondrule population, which exclude potentially related chondrules. We now propose a system of classification which applies to >90% of the chondrules and is based on differences in the composition of the major chondrule components (mesostasis and mineral grains). The resulting groups reflect both primary and secondary processes in a manner somewhat similar to the Van Schmus and Wood classes for chondrites (Table 1). The major difference is that chondrule metamorphism is not isochemical, and the group differences disappear at the highest metamorphic levels (Fig. 1). The Gooding-Keil system of nomenclature is still applicable, the McSween-Scott-Taylor types are integrated into the new system (*e.g.*, for Semarkona, types IA IB and II are included in A1, A2 and the B groups, respectively), and the 'droplet' and 'clastic' chondrules of Dodd are retained in that they roughly correspond to the A and B groups.

TABLE 1. Definitions and Properties of the chondrule groups.

	CL		Meso.	Oliv.			Low-Ca Px.
	Meso.	Grains	Norm. comp.	%FeO	%CaO	CV(%)	%FeO
A1	y	r	~80% plag, An > 50	<2	>0.2	>8	<1.5
A2	y	none/d-r	~80% plag, An > 50	2–5	0.1–0.2	<8	<3.5
A3	b	r	~80% plag, An > 50	<4	>0.2	10–40	<1.4
A4	b	none/d-r	~80% plag, An > 50	>4	0.1–0.2	5–20	2–10
A5	b	none/d-r	>80% plag, An < 50	>10	<0.1	<5	2–10
B1	none/ d-b	none/d-r	25–50% quartz	7–25	>0.08	5–30	2–10
B2	d-p		10–25% quartz	15–20	<0.08	5–30	2–10

y = yellow; b = blue; r = red; none/d-r = none/dull red; none/d-b = none/dull-blue; none/d-p = none/dull-purple.

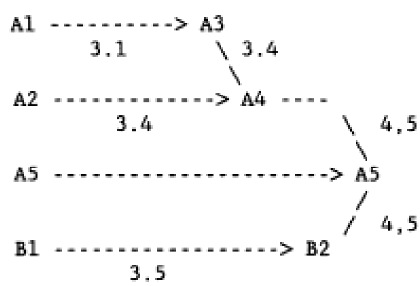

FIG. 1. Schematic of chondrule relationships and petrologic type of host.

Compositional trends in the mesostasis, olivine and pyroxene, and the relative abundance of each chondrule group as a function of petrologic type, suggest that groups A1, A2, A5 and B1 are present in essentially unmetamorphosed material, and that during metamorphism these homogenize, via A3, A4 and B2, to equilibrated group A5, but at different rates. Thus in a given chondrite, the variety of chondrules present depends on (1) the variety originally present (which is remarkably constant from meteorite to meteorite), (2) the degree of metamorphism suffered by the host chondrite, (3) the responsiveness of the individual chondrules to metamorphism. Except for A5, the A series are fairly responsive to metamorphism, while the B series are more sluggish. Clearly, any study of chondrules has to take into account these complications, but sorting them into these 7 groups will help. To date we have only examined type 3 ordinary chondrites, but we suspect that the scheme will apply equally to chondrules in enstatite and carbonaceous chondrites.

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