SILICATE-BEARING SULFIDE-METAL ASSEMBLAGES IN PRIMITIVE ORDINARY CHONDRITES

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Introduction: The ordinary chondrites Adrar 003 (L/LL3.10), Krymka (LL3.2), and Semarkona (LL3.00) belong to the most primitive chondrites known [1]. These rocks were found to contain different types of silicate-bearing sulfide-metal assemblages in terms of texture, size, and relative abundance of silicates and opaques (sulfides, metal). We have studied 53 aggregates within the three chondrites and found that troilite is the most abundant phase within the assemblages. As major silicates olivine and pyroxene occur.

Mineralogy: The assemblages were identified and documented in thin section by optical microscopy in reflected and transmitted light. Most of the assemblages occur as individual objects between chondrules. In several cases these aggregates form broad chondrule rims presumably indicating a close genetic relationship. The mineral sizes within the aggregates vary extremely as well as the relative abundances of silicates and opaques. Besides troilite, pentlandite is of minor abundance and the metal grains analyzed so far are primarily kamacite; taenite only occurs sporadically.

341 olivines and 157 low-Ca pyroxenes were analyzed within these sulfide-metal assemblages by SEM-EDX. Although the range and average composition of pyroxene within the aggregates are similar to those of the bulk chondrites, significant differences were obtained for olivine. Considering all three samples, olivine provides a much broader range in Fa-content in the assemblages than in the bulk rocks. In addition, the average olivine composition of the grains within the aggregates of all three samples (~Fa_{30}) is significantly different from the average composition of olivine in the three bulk rocks (~Fa_{12}; Table 1).

Discussion: The different textural and mineralogical characteristics of the silicate-bearing sulfide-metal aggregates suggest different formation conditions. The differences in olivine compositions (bulk chondrites vs. aggregates) will be considered in detail in ongoing studies.

References: [1] Grossman J. N. and Brearley A. J. 2005. *Meteoritics & Planetary Science* 40:87-122.

Table 1. Compositions of olivine (Ol) and low-Ca pyroxene (Px) in the studied bulk chondrites and within sulfide-metal aggregates (agg.); n=number of analyzed grains; data in mol%.

	Ol (Fa)	*n*	**Px (Fs)**	*n*
Adrar 003				
Bulk chondrite (range)	0.4 - 35.8	98	0.6 - 40.3	74
Average	13.2 ± 8.1		10.4 ± 8.0	
Sulfide-metal agg. (range)	0.3 - 60.0	155	1.4 - 27.4	69
Average	32.4 ± 15.1		10.1 ± 7.0	
Krymka				
Bulk chondrite (range)	0.4 - 47.1	92	1.0 - 32.5	54
Average	12.0 ± 8.5		8.4 ± 7.2	
Sulfide-metal agg. (range)	0.6 - 60.5	128	0.6 - 63.2	65
Average	29.8 ± 16.0		10.0 ± 10.9	
Semarkona				
Bulk chondrite (range)	0.3 - 26.3	65	0.6 - 32.3	46
Average	10.8 ± 6.9		8.9 ± 7.4	
Sulfide-metal agg. (range)	1.1 - 37.3	58	2.6 - 23.4	23
Average	26.3 ± 8.1		9.9 ± 7.2	