CHONDRULES IN THE KAINSAZ CO CHONDRITE: MINERAL COMPOSITION AND ASSEMBLAGES; COMPARISON WITH THE ALLENDE CV AND ORDINARY CHONDRITE CHONDRULES; G.V.Baryshnikova, S.A.Stakheeva, Z.A.Lavrentjeva, K.I.Ignatenko, A.K.Lavrukhina. V.I.Vernadsky Institute of Geochemistry and Analytical Chemistry, USSR Academy of Sciences, Moscow.

The Kainsaz chondrite is the least altered carbonaceous chondrite of the Ornans (CO3) type (1). It is clearly chondritic in structure and contains numerous chondrules and inclusions incorporated into the fine-grained carbonaceous matrix. Earlier (2) we undertook an investigation of the petrography, morphology and chondrule size distribution in this chondrite. In the present study, the mineralogical-structural types have been identified in detail and mineral compositions and assemblages determined for each type. As in ordinary chondrites (3), the Kainsaz chondrite chondrules fall into two main categories: droplet and lithic, the former making up for 39%, the latter 61% on average of the total number of chondrules, to correlate well with available data (4). Most of the droplet chondrules are grouped in two main types.

I. Granular olivine and olivine-pyroxene chondrules with or without opaque mineral inclusions. Principal minerals are olivine (Fa 0.9-11.50), ortho- and low-Ca clinopyroxene (Fs 1.2-7.3) and interstitial glass (An 45.9-80.8). Olivine is often normally zoned both within individual grains and across the chondrule. Accessory minerals are augite (FeO-poor), kamacite, taenite and troilite.

II. Microporphyritic olivine,olivine-pyroxene and pyroxene chondrules with or without opaque mineral inclusions. These chondrules are often zoned: the core contains small olivine insets (Fa 0.6-10.3) with interstitial glass (An 54.3-79.3) while large orthopyroxene phenocrysts (Fs 1.1-2.80 to 6.2) containing micropoikilitic intergrowths of a higher-iron olivine (Fa 27-68.6) group of the periphery. Accessory minerals are the same as in type I. For the first time in this meteorite, one of the chondrules was found to contain Na-pyroxene-jadeite which occurs as thin rims on olivine crystal and small grains in relatively albite glass of mixed composition (containing a pyroxene component).

In addition to these two main types which account for >90% of the total number of the chondrules, there are also barred olivine (observed in thin sections only), excentroradial pyroxene (Fs 0.9-6.7), cryptocrystalline olivine (Fa 53.7-58.3) and pyroxene (Fs 3.4-13.0), glassy (An 5-16.8), sulfide-metal, micropoikilitic (orthopyroxene Fs 1.55-8.8, olivine Fa 8.6-12.8; 50.3-3.52) as well as complex chondrules.

Lithic chondrules only occur as granular and microporphyritic varieties where plagioclase occurs in place of glass throughout. Their olivine and pyroxene compositions resemble those from some such varieties of droplet chondrules.

CHONDRULES IN KAINSAZ CO

Baryshnikova G.V. et al.

Comparing data available on the characteristics of the Allende (5) and ordinary (3) chondrite chondrules of different structural types with the results for the Kainsaz chondrite chondrules (the present study and (2)) we arrive to the following conclusions:

1. Kainsaz chondrite chondrules are small and show a narrow monodispersed size range (2).

2. Unlike Allende, Kainsaz is similar to ordinary chondrites in diversity of structural types although their relative abundances differ somewhat, rare type chondrules being less abundant. Also, ordinary chondrites do not contain microporphyritic zoned chondrules.

3. Microporphyritic chondrules in Kainsaz show a distinct bimodal distribution of olivine compositions (Fa 0.6-20.3 and 30-40) and contain 54-68.6 Fa olivine to set this type chondrules apart from ordinary and Allende chondrite chondrules.

4. Granular chondrules are similar in their mineral composition to Allende and ordinary chondrite chondrules.

5. Unlike Allende, Kainsaz contains pyroxene chondrules of different structural types, as do ordinary chondrites.

6. Some of the microporphyritic Kainsaz chondrules are featured in jadeite rims which are not found in chondrites of other types. By analogy with terrestrial jadeite, the jadeite-bearing chondrules can be supposed to have either undergone metasomatic alteration or else experienced a shock event prior to accretion.

7. The glass in Kainsaz chondrite chondrules is less homogeneous (An 45.9-80) than the Allende glass (An 75-98 (5)) but is relatively more homogeneous than the glass from ordinary chondrite chondrules (An 10-77 (3)).

8. Opaque minerals in Kainsaz mainly occur within chondrules and occasionally in the matrix whereas in Allende they are incorporated in the chondrules, and in ordinary chondrites mostly in the matrix. Opaque mineral assemblages are similar to those from ordinary chondrites.

9. The Kainsaz chondrite contains no Ca-Al-rich chondrules.

To sum up, the Kainsaz chondrite chondrules hold an intermediate position between the Allende and ordinary chondrite chondrules. It is believed that the Kainsaz chondrules probably were formed under P-T conditions different from those under which both ordinary and Allende chondrite chondrules were formed.

References: (1) McSween H.Y. (1977) GCA 41, 477; (2) Baryshnikova G.V. et.al. (1983) LPS XIV, 21; (3) Baryshnikova G.V., Lavrukhina A.K. (1982) Geokhimiya, N4, 490; (4) King T.V.V., King E.A. (1979) Meteoritics, 13, 47; (5) Lavrukhina A.K. et al. (1986) Meteoritika, 46, in press.