A CLASSIFICATION OF SEVERAL YAMATO-74 CHONDRITES

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Abstract: Nine Yamato-74 chondritic meteorites have been classified based on a simplified version of the Van Schmus-Wood classification. The result is as follows: Yamato-74348 is H4 chondrite, Yamato-74349 and -74379 are H4–5 chondrite, and Yamato-74244, -74250, -74265, -74306, -74319 and -74382 are H5 chondrite.

1. Introduction

We have continued to assist in the preparation of a catalog of the Yamato meteorites collected in Antarctica in 1974, at the request of Dr. K. YANAI, curator of the National Institute of Polar Research. Small fragments (0.05–0.18 g) of nine Yamato-74 chondritic meteorites (Yamato-74244, -74250, -74265, -74306, -74319, -74348, -74349, -74379, and -74382) were supplied for classification. Thin sections of the small fragments were kindly prepared by Mr. G. AZUMA of the National Institute of Polar Research for our examination.

2. Experimental

The classification procedure we employed is based on a simplified version of the classification method proposed by VAN SCHMUS and WOOD (1967). The chemical group is determined by chemical compositions of ferromagnesian minerals in chondritic meteorites. The petrologic type is determined by textural characteristics seen in chondritic meteorites.

The ferromagnesian minerals (olivine and orthopyroxene) of the equilibrated chondrites show different Fe/Fe+Mg (atomic %) ratios in different chemical groups. YANAI *et al.* (1978) have determined the range of the ratios for the equilibrated H, L and LL group chondrites, that is, H (16.5–20.0), L (22.0–26.0), LL (27.0–32.0) for olivine, and H (15.0–17.8), L (18.2–23.8), LL (24.2–26.0) for orthopyroxene, respectively. Therefore, one can determine the chemical group by the Fe/Fe+Mg ratios of the ferromagnesian minerals, except for the unequilibrated (petrologic type 3) chondrites which show large variability of olivine and orthopyroxene compositions.

The quantitative chemical analyses of the ferromagnesian minerals in the supplied specimens were carried out with a system of computer controlled electron probe X-ray micro-analyzer at Chemical Analysis Center of the University of Tsukuba (NISHIDA *et al.*, 1979).

The petrologic type defined by textural characteristics (VAN SCHMUS and WOOD, 1967) is as follows. Type 3 shows very sharply defined chondrules with no intergrowth, fine-grained opaque matrix, and absence of secondary feldspar. Type 4 shows well defined chondrules with weak intergrowth with adjacent chondrules, transparent microcrystalline matrix and microcrystalline aggregate of secondary feldspar. Type 5 shows chondrules with strong intergrowth with adjacent chondrules and matrix, recrystallized matrix and microcrystalline aggregate of secondary feldspar. Type 6 shows poorly defined chondrules, strongly recrystallized coarse-grained matrix and presence of clear secondary feldspar.

The petrologic type of the supplied specimens was determined by examination of the thin sections, employing the criteria stated above. A set of the pictures for the textural variations by VAN SCHMUS and WOOD (1967) and the thin sections of Yamato-74191 (L3) and Modoc (L6) chondrites were effectively used for this examination.

3. Result

Table 1 shows mean compositions (Fe/Fe+Mg, atomic %) of olivines and

Table 1. Mean compositions and % mean deviations of olivines and orthopyroxenes in several Yamato-74 chondrites.

Sample No.	Olivine			Orthopyroxene		
	No. of measurements	Mean Fe/Fe+Mg (atomic %)	% mean dev.	No. of measurements	Mean Fe/Fe+Mg (atomic %)	% mean dev.
Yamato-74244	13	19.1	4.1	14	17.7	5.2
-74250	8	17.6	2.9	18	16.1	4.2
-74265	7	18.2	2.0	8	16.1	2.3
-74306	16	17.9	4.4	17	16.3	4.5
-74319	26	18.6	3.9	16	17.0	4.6
-74348	30	18.5	5.2	23	16.6	4.6
-74349	16	18.0	3.4	13	16.6	4.4
-74379	11	18.0	4.0	27	16.6	4.6
-74382	32	19.1	3.0	9	16.7	4.0
		H (16.5–20.0)*			H (15.0–17.8)*	

* The compositional range for the ferromagnesian minerals in H chondrites (YANAI *et al.*, 1978).

Table 2. Petrologic type determined by textural characteristics of several Yamato-74 chondrites.*

Sample No.	Texture of chondrule	Texture of matrix	Degree of development of feldspar	Remarks
Yamato-74244	5	5	4–5	H5
-74250	5	5	4–5	H5
-74265	5	5	4–5	H5
-74306	5	5	4–5	H5
-74319	5	5	4–5	H5
-74348	4	4	4–5	H4
-74349	4–5	4–5	4–5	H4–5
-74379	4–5	4–5	4–5	H4–5
-74382	5	5	4–5	H5

* See text.

orthopyroxenes in the supplied specimens, together with % mean deviations defined by VAN SCHMUS and WOOD (1967). "Greater than 5% mean deviation" corresponds to petrologic type 3 and "less than 5% mean deviation" to petrologic types 4–6.

All of the mean compositions of the olivines and the orthopyroxenes fall within the compositional range determined by the equilibrated H chondrites, indicating all of the chondrites supplied belong to H group. All of the % mean deviations of the minerals are less than 5%, suggesting all of the chondrites correspond to petrologic types 4–6.

Table 2 shows petrologic types of the supplied specimens determined by the textural characteristics on chondrules, matrix and feldspar, together with concluding remarks obtained by our classification procedure.

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